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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Koichiro Hori et al  
For: Endoscope With Position Display For Zoom Lens  
Unit And Imaging Device

Attorney's Docket No.: OKTA-6 RE

BOX PATENT APPLICATION  
Assistant Commissioner For Patents  
Washington, D.C. 20231

Sir:

FILING OF PATENT APPLICATION UNDER 37 CFR 1.10

The attached reissue application is being filed under the provisions of 37  
CFR 1.10.

Applicants' attorney is also submitting the requisite fee as calculated on  
the attached transmittal letter.

EXPRESS MAIL MAILING LABEL NUMBER EJ932849124US

DATE OF DEPOSIT 3 January 2000

I HEREBY CERTIFY THAT THIS PAPER OR FEE IS BEING DEPOSITED  
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COMMISSIONER FOR PATENTS, WASHINGTON, D.C. 20231.

Nicholas A. Pandiscio

(PERSON MAILING)

*Nicholas A. Pandiscio*  
(SIGNATURE)

Respectfully submitted,

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Assistant Commissioner For Patents  
Washington, D.C. 20231

Sir:

Transmitted herewith for filing is the reissue patent application of:

Inventor: Koichiro Hori et al  
For: Endoscope With Position Display For Zoom Lens Unit And Imaging Device

Enclosed are:


- ☒ 1 sheets of drawings.  
☐ An assignment of the invention to: \_\_\_\_\_  
☐ A verified statement to establish small entity status.  
☒ ~~Information Disclosure Statement~~, Offer to Surrender, Reissue Declaration, Affidavit, and Order For Title.

The filing fee has been calculated as shown below:

Small Entity				Large Entity		
For:	No. Filed	No. Extra	Rate	Fee	Rate	Fee
Basic Fee				\$345.00		\$690.00
Total Claims	14 - 20	0	x \$ 9.00	0	x \$18.00	
Ind. Claims	3 - 3	0	x \$39.00	0	x \$78.00	
Mult. Claims			+ \$130.00	0	+ \$260.00	
Total				\$345.00	Total	

- ☐ Please charge my Deposit Account No. 16-0221 to cover the filing fee and assignment recording fee. A duplicate copy of this sheet is enclosed.
- ☒ A check in the amount of \$370.00 to cover the filing fee, and also the title report fee is enclosed.
- ☒ The Commissioner is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account No. 16-0221. A duplicate copy of this sheet is enclosed.
- ☒ Any additional filing fees required under 37 CFR 1.16.
- ☒ Any patent application processing fees under 37 CFR 1.17.
- ☒ The Commissioner is hereby authorized to charge payment of the following fees during the pendency of this application or credit any overpayment to Deposit Account No. 16-0221. A duplicate copy of this sheet is enclosed.
- ☒ Any patent application processing fees under 37 CFR 1.17.
- ☐ The issue fee set in 37 CFR 1.18 at or before mailing of the Notice of Allowance, pursuant to 37 CFR 1.311(b).
- ☒ Any filing fees under 37 CFR 1.16 for presentation of extra claims.

Respectfully submitted,

  
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PATENTIN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application for  
Reissue of: U.S. Patent No. 5,662,584

Original Ser. No.: 08/545,927

Original Filing Date: October 20, 1995

Applicants: Koichiro Hori et al.

For: ENDOSCOPE WITH POSITION DISPLAY FOR  
ZOOM LENS UNIT AND IMAGING DEVICE

Original Examiner: J. Leubecker (Group 3302)

**Reissue Docket No.: OKTA-6 RE**

Box 7  
Assistant Commissioner for Patents  
Washington, D.C. 20231

OFFER TO SURRENDER PATENT AND ASSENT BY ASSIGNEE  
(Pursuant to 35 USC 251 and PTO Rule 1.178)

We, Koichiro Hori and Herbert A. Thaler, Applicants of the accompanying application for reissue of the above-identified U.S. Letters Patent, of which Vista Medical Technologies, Inc. is now sole owner by written and recorded assignment from us, and on whose behalf and with whose assent the accompanying application for reissue is made, hereby offer to surrender said Letters Patent.

Date: Dec 20, 1999

Koichiro Hori  
Koichiro Hori

Date: Dec 28, 1999

Herbert A. Thaler  
Herbert A. Thaler

OKTA-6 RE



The undersigned, assignee of the entire right, title and interest in the above-identified Letters patent, hereby assents to the surrender of said Letters Patent and the accompanying reissue application.

Vista Medical Technologies, Inc.

Date: Dec. 20, 1999

By: Koichiro Hori  
Koichiro Hori  
Vice-President

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PATENTIN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application for

Reissue of: U.S. Patent No. 5,662,584

Original Serial No.: 08/545,927

Original Filing Date: October 20, 1995

Applicants: Koichiro Hori et al.

For: ENDOSCOPE WITH POSITION DISPLAY FOR  
ZOOM LENS UNIT AND IMAGING DEVICE

Original Examiner: J. Leubecker (Group 3302)

**Reissue Docket No.: OKTA-6 RE**

3 January, 2000

Box 7

Assistant Commissioner for Patents

Washington, D.C. 20231

ORDER FOR TITLE REPORT

Pursuant to 37 CFR Section 1.171, an order for a title report on the above identified U.S. Patent is hereby made, to be placed in the file of the application for reissue thereof filed herewith.

Vista Medical Technologies, Inc. ("Assignee") owns 100% interest in the above-identified patent by virtue of an assignment executed on September 23, 1996 and recorded in the United States Patent and Trademark Office, on October 1, 1996, at Reel 8159, Frame 0005. Therefore, Assignee retains the right to execute submit this Order For Title Report and to file and prosecute the related reissue application submitted herewith.

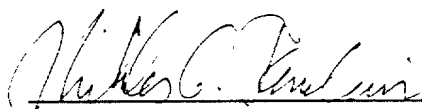
OKTA-6 RE



The enclosed check in the amount of \$ 370.00 is believed to cover the PTO fee for the title report, as required under 37 CFR 1.19(b)(4), as well as the official filing fee for the reissue application. Please charge any additional fees or credit any overpayment to Deposit Account No. 16-0221.

A copy of this order is attached for obtaining verification of such charge or credit.

Respectfully submitted,

 3 January 2000

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Attorney For Applicants

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OKTA-6 RE



APPLICATION

FOR

REISSUE OF

UNITED STATES LETTERS PATENT

NO. 5,662,584

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006010-1E2B2460



# ENDOSCOPE WITH POSITION DISPLAY FOR ZOOM LENS UNIT AND IMAGING DEVICE

## PRIORITY DATA

This is a continuation-in-part of U.S. patent application Ser. No. 08/319,886, filed 7 Oct. 1994 for "Electronic Endoscope With Zoom Lens System" (Attorney Docket No. OKTA-1), now U.S. Pat. No. 5,582,576.

## FIELD OF THE INVENTION

The present invention relates generally to endoscopes and more specifically to electronic image displays for endoscopes which have a solid state imaging device and an optical system that includes a zoom lens unit for transmitting images to the solid state imaging device.

## PRIOR ART

Endoscopes, which are instruments used to inspect cavities or openings, have found a great number of applications in medicine and other technology. In the field of medicine, the use of endoscopes permits inspection of organs or other biological specimens for the purpose of inspecting a surgical site, sampling tissue and/or facilitating the manipulation of other surgical instruments, usually with the objective of avoiding invasive and traumatizing surgical procedures.

Older conventional endoscopes used in medicine have an objective lens unit at their distal (forward) ends which transmits an image of the area forward of the objective lens unit to the proximal (rear) end of the endoscope for viewing in an eye-piece, the image being transmitted to the eye-piece via an image forwarding means in the form of a so-called relay lens set or an optical fiber bundle unit. In more recent years, in place of the eye-piece and at least part of the image forwarding means, it has been preferred to provide a small size solid state video imaging device, such as one constituting a CCD chip, in the imaging plane of the objective lens, and applying the output of that video imaging device via a suitable electronic transmission system to a video monitor for viewing by the user. With both types of image transmitting and viewing arrangements, the surgeon can view the displayed image and use the information conveyed by that image to manipulate the endoscope and also other surgical instruments that have been inserted into the patient via another incision or opening in the patient's body. In the case of endoscopes that incorporate a solid state video imaging device, the image seen by the objective lens unit can be observed in the display provided by the video monitor with or without magnification.

An important consideration of recent attempts to provide electronic endoscopes is to maximize the extent that the surgical site is encompassed by the endoscope image seen by the surgeon (i.e., the field of view) without any substantially detrimental loss of image resolution.

As is well known, a critical requirement of surgical endoscopes is that the maximum cross-sectional dimension of the endoscope must be kept quite small in keeping with the objective of avoiding invasive and traumatizing surgical procedures. However, it also is necessary that the endoscope have an illumination lumen or duct of a size that will assure adequate illumination of the surgical site being inspected. In addition it is desirable to provide an optical system in the endoscope that maximizes the extent of the surgical site that is encompassed by the image seen by the surgeon (i.e., the field of view) without any substantially

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detrimental loss of image resolution. In recognition of the two-fold desire to maximize the field of view and image resolution, efforts have been made by others to provide endoscopes with a zoom lens system. Such endoscopes typically include an objective lens stage, a zoom lens stage, and a focusing lens for making certain that the image passed by the zoom lens is in focus. In the case where a solid state imaging device is used in an endoscope, the desired focus control can be achieved and maintained by shifting the solid-state imaging device along the axis of the endoscope in a direction and by an amount sufficient to achieve the desired focus control.

An example of an endoscope having a zoom lens and a movable imaging device system is disclosed by U.S. Pat. No. 4,488,039, issued 11 Dec. 1984 to Masamichi Sato et al for "Imaging System Having Vari-Focal Lens For Use In Endoscope". In essence the arrangement disclosed in U.S. Pat. No. 4,488,039 is one in which the position of the imaging device that is required to achieve proper focusing is estimated on the basis of the position of the zoom lens. However, the Sato et al endoscope is handicapped by the fact that the process of estimating is conducted "on the fly", which appears to limit the accuracy and/or response time of the system with respect to optimizing continuous focusing during movement of the zoom lens.

U.S. Pat. No. 4,488,039 suggests that the endoscope may be modified so as to make its control system capable of detecting changes in the position of the imaging device and then estimating an appropriate position for the zoom lens in order to achieve proper focusing of the sensed image on the imaging surface of the imaging device. That arrangement appears to suffer from the need to estimate the appropriate position for the zoom lens unit as the imaging device is being moved, so that the system disclosed by U.S. Pat. No. 4,488,039 does not embody a practical electrical mechanical design that is relatively inexpensive to manufacture and also is characterized by an efficient and reliable mode of operation.

The endoscope described in said copending U.S. application Ser. No. 08/319,886 embodies a zoom lens unit which is under operator control, plus a CCD imaging device which also is under operator control. As the zoom lens unit position is modified, the lens system focal plane shifts (inward or outward according to the direction of movement of the zoom lens unit) causing the image seen by the CCD imaging device to become unfocused. Also as the object of attention in the video image varies in distance from the lens system, the position of the lens system focal plane also shifts, causing the image projection seen by the CCD imaging device to become unfocused. Accordingly, the endoscope invention of said copending U.S. application Ser. No. 08/319,886, embodies an automatic control system (hereinafter described) which serves to capture a properly focused image. The automatic control system compensates for both focal plane shifts by automatically shifting the CCD imaging device position to track the lens system focal plane, and thereby maintain proper focus at the image-receiving surface of the imaging device. The control system requires as input parameters specified by the operator both the zoom lens setting and the distance from the lens system to the object of interest (the "object distance"). With that information (plus its knowledge of the characteristics of the lens system) the control system is able to maintain proper focus under all conditions. Thus, the operator may vary the zoom and deflect distance parameters over some predetermined allowable range of values, and expect the control system to properly adjust focus to track his or her commands.



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## SUMMARY OF THE INVENTION

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Other objects, advantages and novel features of the invention will become more apparent from a consideration of the 25 following detailed description when considered in conjunction with the accompanying drawings.

### BRIEF DESCRIPTION OF THE DRAWINGS

30 FIG. 1 is a perspective view, partially in section, illustrating a preferred embodiment of the invention;

FIG. 2 is a perspective view similar to FIG. 1, with certain components removed to better illustrate the construction of the device;

35 FIG. 3 is a view similar to FIG. 2, but with additional components removed to better illustrate the construction;

FIG. 4 is a cross-sectional view on a greatly enlarged scale taken along line 4—4 of FIG. 1;

FIG. 5 is a perspective view on an enlarged scale of certain components of the endoscope, with certain components broken away;

FIG. 6 is a fragmentary exploded view on an enlarged scale of certain components of the endoscope;

45 FIG. 7 is an enlarged fragmentary perspective view illustrating the drive trains for the zoom lens unit and the imaging device, with portions broken away;

FIG. 8 is a side view in elevation further illustrating the drive trains for the zoom lens unit and the imaging device;

FIG. 9 is a front end view of the endoscope illustrating the disposition of the optical fibers used to illuminate the surgical site;

FIG. 10 is a fragmentary sectional view in elevation of the elongate bushing used to support the drive rod for the imaging device;

FIG. 11 is a fragmentary sectional view on an enlarged scale illustrating how the bundle of optical fibers is terminated at the proximal end of the endoscope;

FIG. 12 is a schematic view of the electronic control console to which the endoscope of FIG. 1 is connected;

FIG. 13 is a block diagram identifying components of the control system for the endoscope, including certain components established by programming of the computer that form part of the control console;

FIG. 14 is a schematic view further illustrating the control system;



Referring now to FIGS. 2, 4, 5 and 10, mounted within and locked to inner tube 20 is an elongate bushing 34 that has a sleeve bearing 36 located at each end of its central bore or lumen 35 (FIG. 10). Bearings 36 are made of a material having a low coefficient of friction. The proximal (rear) end of bushing 34 terminates substantially flush with the corresponding end of inner tube 20. The forward end of bushing 34 terminates intermediate the opposite ends of tube 20 (FIG. 5). As seen in FIG. 4, bushing 34 has a generally cylindrical outer surface 38 sized so that it makes a close or tight fit with the inner surface of inner tube 20. That generally cylindrical outer surface of the bushing is dis-



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The drive means for zoom unit 60 comprises a reversible electrical d.c. motor 106. Both it and motor 80 are attached to frame 16 by a removable clamp 82. Motor 106 is identified hereinafter as the "zoom motor". The output shaft of motor 106 carries a pinion gear 108 that meshes with a pinion gear 110 that is mounted on and secured to a shaft 112. The latter is rotatably mounted to mutually spaced portions 114, 116 of frame 16. Shaft 112 carries two axially spaced gears 120A and 120B that mesh with teeth 102 on rods 100A and 100B respectively, whereby rotation of shaft 112 by operation of motor 106 will cause linear motion of rods 100A and 100B, and thereby zoom lens unit 60, lengthwise of inner tube 20 in a direction determined by the



Referring now to FIG. 13, the housings of focus motor 80 and zoom motor 106 include position-sensing encoders represented schematically at 120 and 122 that are coupled to the output shafts of the motors and are designed to provide pulse-type signal outputs that are polarized plus or minus according to the direction of movement of the output shafts of motors 80 and 106 respectively. Shaft encoders 120 and 122 may take various forms but preferably they are incremental digital encoders. Because incremental position-sensing shaft-coupled encoders are well known, details of construction of the encoders are not provided herein.

Optical fiber cable 10 is coupled to console 130 so as to be able to transmit light from light source 134 to light fibers 28, whereby when that light source is energized by operation of the controller, the resulting light beam will illuminate the objective field of view. Multi-wire cable 12 is connected at its outer end to power supply 132 and computer 138; at its inner end cable 12 has certain of its wires coupled by a connector (not shown) to terminals of the CCD chip of imaging device 50 and others of its wires connected to motors 80 and 106 and the control switches associated with buttons 8A-8D.

Referring again to FIG. 13, the switch buttons 8A and 8B form part of two focus control switches 144A and 144B, while switch buttons 8C and 8D form part of two zoom control switches 144C and 144D. Preferably, a second like set of foot-operated switches (not shown), are added in parallel with switches 144A-D so as to give the surgeon the option of controlling maneuvering of imaging device 50 and zoom lens unit 60 using one of his feet rather than one of his hands. As explained further hereinafter, operating switch 144A will energize focus motor 80 so as to cause the imaging device to move forward toward the distal end of inner tube 20, while operating switch button 144B will energize focus motor 80 so as to cause reverse movement of the imaging device. Similarly, operating switch button 144C will energize motor 106 so as to cause the zoom lens unit to move forward toward the distal end of inner tube 20, while



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At this point, a focus motor servo control loop (FIG. 19) is activated, which control loop provides the following operation. As the imaging device 50 is moved in a "Down" direction to its predetermined start-up position, encoder 120 will generate pulses that are accumulated in counter 162. The output of object distance counter 160, preset by the computer to the predetermined start-up value "n" and the output of zoom motor position counter 164, are applied to E-prom 142 to obtain an output from the zoom/focus lookup table that has a value representing the desired imaging device position. The output from E-prom 142 (representing the desired CCD position) and the output of CCD position counter 162 (representing the actual CCD position) are applied to comparator 174. Depending on whether the actual CCD position represented by the output of counter 162 is



It is to be appreciated that when its main power switch (not shown) is turned on and/or the reset switch is actuated, the control system described above will automatically set the imaging device 50 and the zoom lens unit to a preselected position which provides a predetermined field of view with sharp focusing at the CCD device of the image seen by the objective lens. Thereafter, the operator has the advantage that by depressing either of the buttons 8C and 8D, the field of view may be changed without changing the object distance between the objective lens and the object being viewed. Additionally, if the need arises to change the posi-



tion of the endoscope so as to change the object distance, the operator has the option of utilizing buttons 8A and 8B to refocus the image, and also the option of utilizing buttons 8C and 8D to change the field of view without again having to utilize the buttons 8A and 8B to change the position of the imaging device in a direction to restore or maintain a sharp image for viewing on displaying device 140.

FIG. 20 generally illustrates in diagrammatic form a system for providing an electronically generated display of the optical image that is passed by the objective lens unit 48 and zoom lens unit 60 to imaging device 50. An endoscope video signal derived from imaging device 50 is processed by conventional video circuits identified generally at 200 to provide signals that are applied to a TV monitor 204 so as to cause the latter to reproduce as a TV image the optical image seen by the endoscope's objective lens unit. The video circuits 200 and the circuits hereinafter described are preferably embodied in display module 140 (FIG. 12). The signal processing video circuits may take various forms known to persons skilled in the art and do not constitute part of the present invention. Suffice it to say that the optical image is reproduced with a magnification and field of view determined by the position of the zoom lens unit and a focusing accuracy determined by the position of imaging device 50 along the endoscope's optical axis.

Turning now to FIGS. 21 to 28, the present invention involves provision of means for generating video image markers ("indicators") that provide the surgeon with an indication of the instantaneous zoom and focus settings as well as the maximum and minimum zoom and focus settings. When focus control button 8A or 8B is operated, two vertically spaced rectangles are created on the TV monitor screen, one representing the instantaneous setting of the imaging device (focus display) and the other representing the instantaneous setting of the zoom lens unit (zoom display). The same markers are displayed if either of the zoom control buttons 8C and 8D are depressed. For convenience, these rectangular markers representing instantaneous settings are identified as "bar-graph displays" in recognition of the fact that they move horizontally in synchronism with movement of the imaging device and the zoom lens unit so that their horizontal positions provide an indication of the instantaneous positions of the imaging device and the zoom lens unit. Additionally, as the imaging device and the zoom lens unit approach either of their end limits of travel, i.e. their maximum or minimum limits, the display control system additionally generates a limit position marker in the form of an additional rectangular display. The instantaneous rectangular position display markers are displayed only when one of the control buttons 8A-8D is operated and for a brief period after the button has been released, and a maximum or minimum limit marker is generated only as the imaging device or the zoom lens unit, as the case may be, approaches its maximum or minimum limit position respectively. The maximum and minimum limit markers are extinguished at the same time as the instantaneous position markers.

As represented in FIG. 21, the system for generating and controlling the position and limit marker displays comprises a video sync stripper circuit 206 which recovers or develops from the endoscope video signal output of imaging device 50 a vertical sync signal (V-Sync), a horizontal sync signal (H-Sync), and also a clock signal identified hereinafter as a "pixel clock". Those signals are applied as input signals to marker display control circuits, identified generally by numeral 210 which include inter alia, a pixel counter 212, a line counter 214, and pixel and line comparators 216 and

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The output of pixel counter 212 is applied to three different comparators 216A, 216B, and 216C. Comparator



65 The two AND gate units of FIGS. 27C and 27D are similar to those of FIGS. 27A and 27B, except that with AND gate 266 the "Enable Maximum Display". "Enable



The marker display capability provided by the present invention is advantageous to the operator in providing feedback as to the parameters of the zoom lens unit and the imaging device in relation to their maximum and minimum end limits.



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3. Apparatus according to claim 1 wherein said zoom lens unit is movable between a first minimum position and a second maximum position, and said electronic means is adapted to cause said display means to generate a first image representative of said minimum position of said zoom lens unit and a second image representative of said maximum position of said zoom lens unit.

5. Apparatus according to claim 1 wherein said imaging device is movable between a first minimum position and a second maximum position, and said electronic means is adapted to cause said display means to generate a first image representative of said minimum position of said imaging device and a second image representative of said maximum position of said imaging device.

7. An endoscope apparatus comprising:

ting light to illuminate an object viewed by said objective lens unit;



means attached to said handle assembly for connecting said proximal end of said light transmitting means to a light source;

control means for operating said first and second drive means;

display means responsive to said imaging device output signal for generating a video reproduction of the image passed by said objective lens unit; and

electronic means responsive to said imaging device output signal for

causing said display means to generate a video image representative of the position of at least said zoom lens unit or said imaging device.

8. Apparatus according to claim 7 wherein said objective lens unit and said zoom lens unit have a common optical axis.

9. Apparatus according to claim 7 further including light-transmitting means disposed in said space between said inner and outer tubes, wherein said light-transmitting means having has a distal end and a proximal end with said distal end terminating at the distal end of said outer tube.

10. Apparatus according to claim 7 wherein said first and second drive means comprise first and second reversible electrical motors respectively.

11. Apparatus according to claim 10 further including user-operable switch means carried by said handle assembly for selectively operating said first and second electrical motors.

12. Apparatus according to claim 7 further comprising means for sensing the extent and direction of movement of said zoom lens unit and said imaging device relative to said objective lens unit and for producing output signals indicative of the extent and direction of said movement, and means for coupling said output signals to said control means for use in controlling the relative positions of said zoom lens unit and said imaging device so that said imaging device is positioned at the focal plane of said zoom lens unit, whereby the image seen by said objective lens and projected by said zoom lens unit is in focus at the image-receiving surface of said imaging device.

13. Apparatus according to claim 7 further comprising first and second means for sensing the extent and direction of movement of said zoom lens unit and said imaging device respectively relative to said objective lens unit and for producing first and second output signals respectively indicative of the extent and direction of movement of said zoom lens unit and said imaging device respectively, and means for coupling said output signals to said control means for use in controlling the relative positions of said zoom lens unit and said imaging device so that at each position of said zoom lens unit said imaging device is positioned at the focal plane of said zoom lens unit, whereby the image seen by said objective lens and projected by said zoom lens unit is in focus at the image-receiving surface of said imaging device.

14. An endoscope apparatus comprising:

an inner tube having a distal end and a proximal end; an outer tube surrounding said inner tube;

a solid state imaging device mounted within and movable along said inner tube;

an objective lens unit mounted within and fixed to the distal end of said inner tube;

a zoom lens unit mounted within and movable along said inner tube; said zoom lens unit being disposed between said objective lens unit and said imaging device;

a plurality of light-transmitting fibers disposed between said inner and outer tubes, said fibers extending substantially to the distal end of said inner tube so that light transmitted thereby will illuminate the objective field;

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- a solid state imaging device disposed within said tube and attached to said distal end of said shaft so as to be movable therewith along the axis of said tube, said imaging device having a light receiving surface for receiving an image transmitted by said objective lens unit and being capable of generating an output signal representative of the image transmitted by said objective lens unit;
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- 10 display means responsive to said imaging device output signal for generating a video reproduction of the image passed by said objective lens unit; and
- means responsive to said imaging device output signal for causing said display means to generate a video image representative of the position of at least said zoom lens unit or said imaging device.
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\* \* \* \* \*

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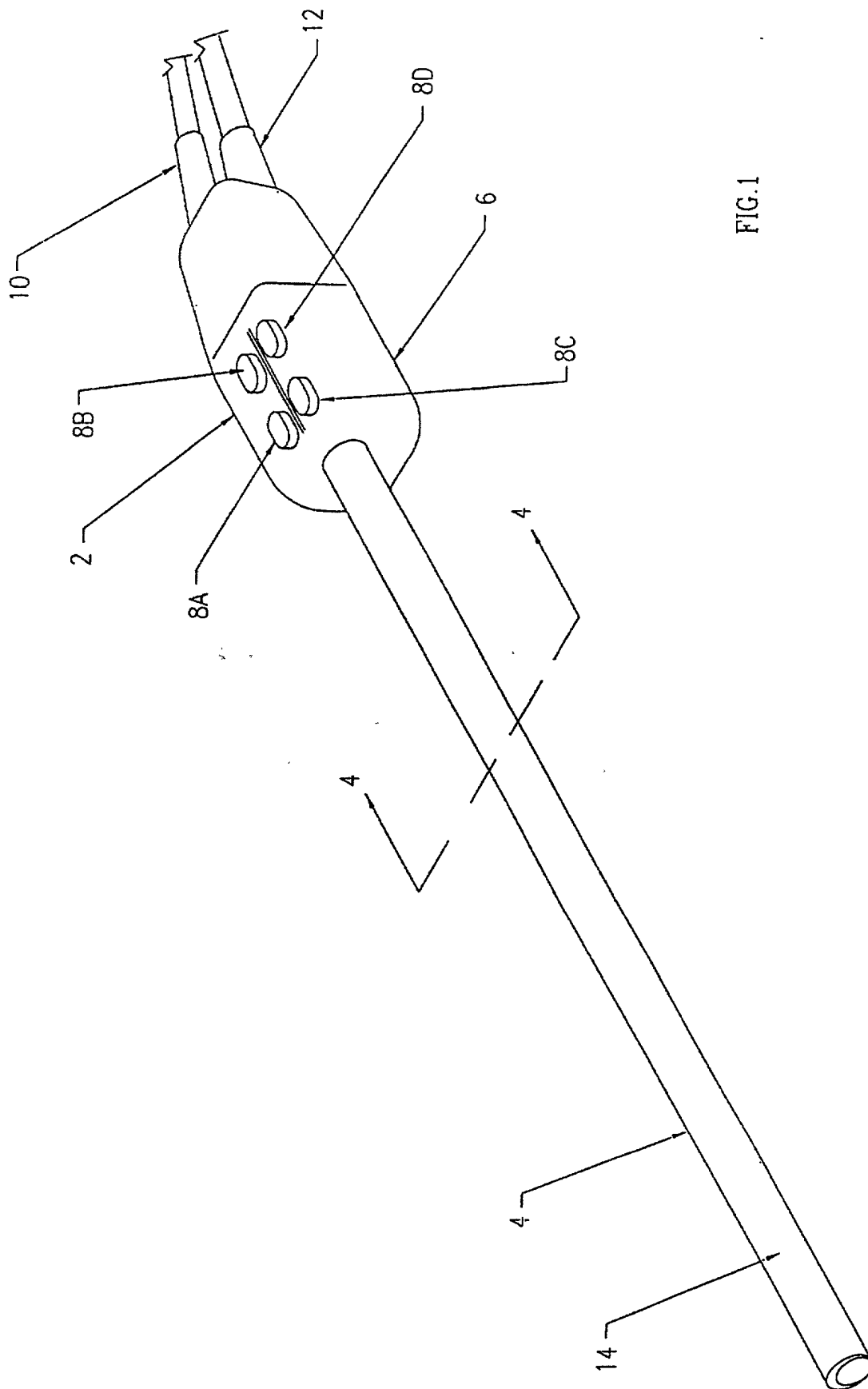


FIG. 1



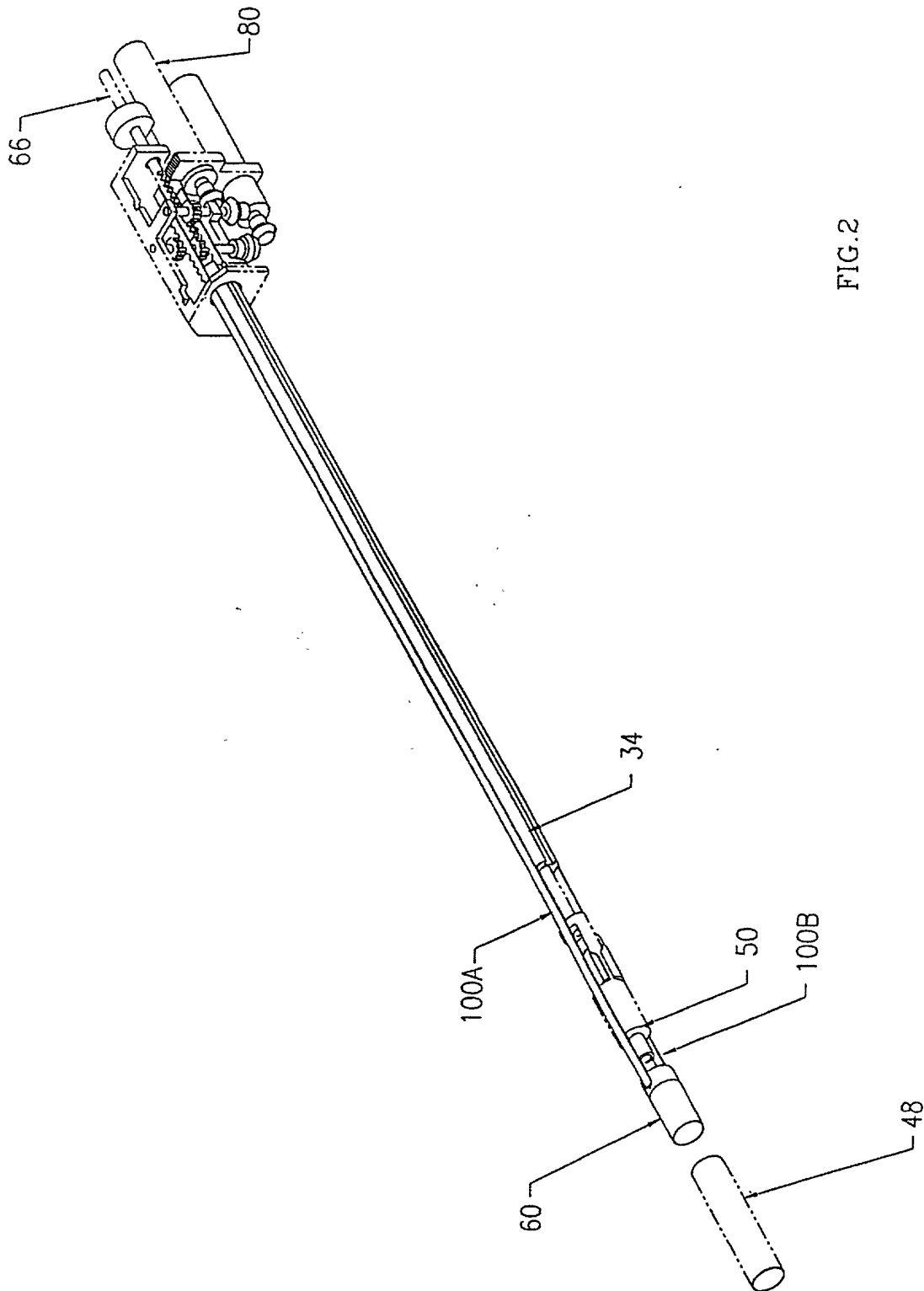


FIG. 2



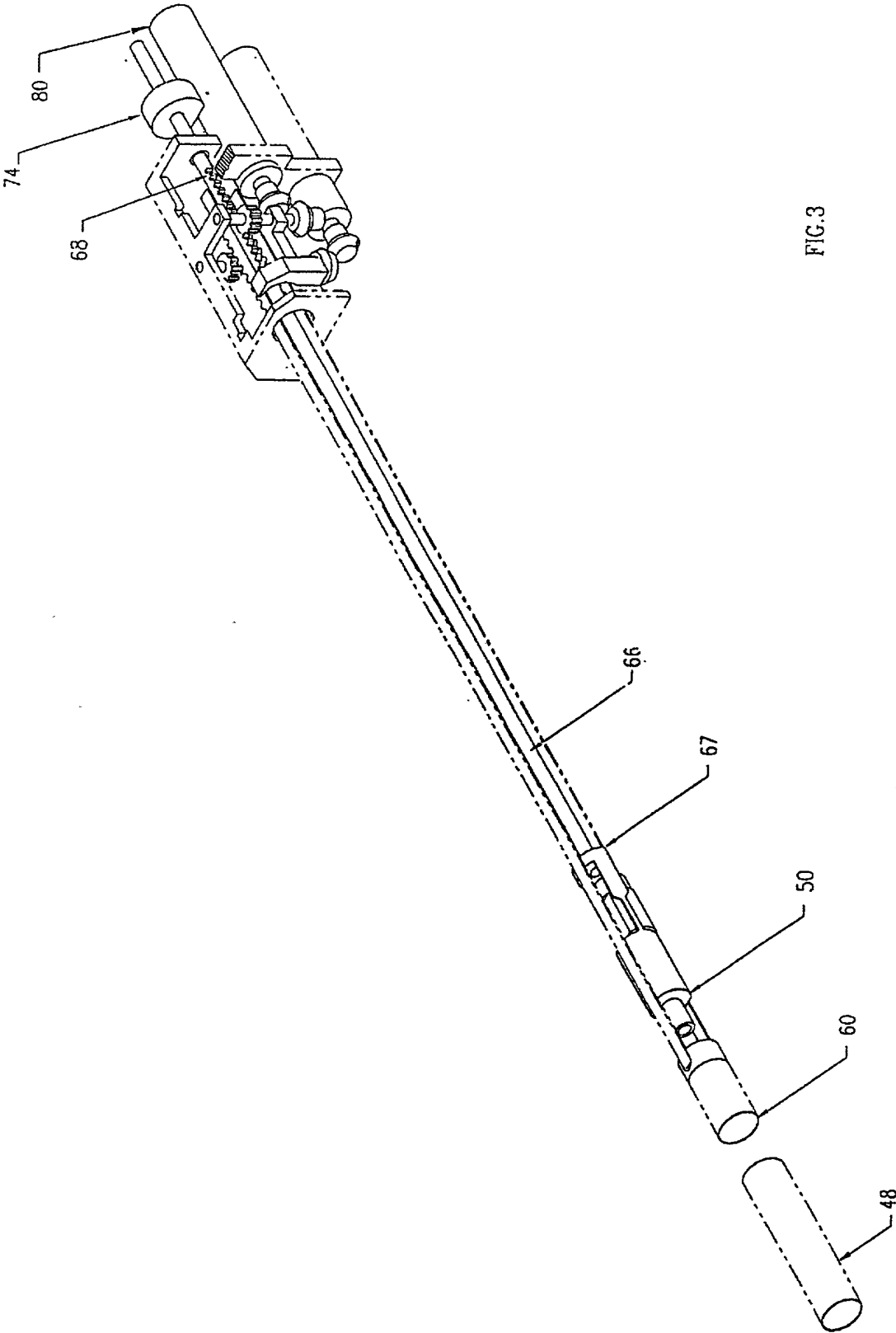


FIG. 3



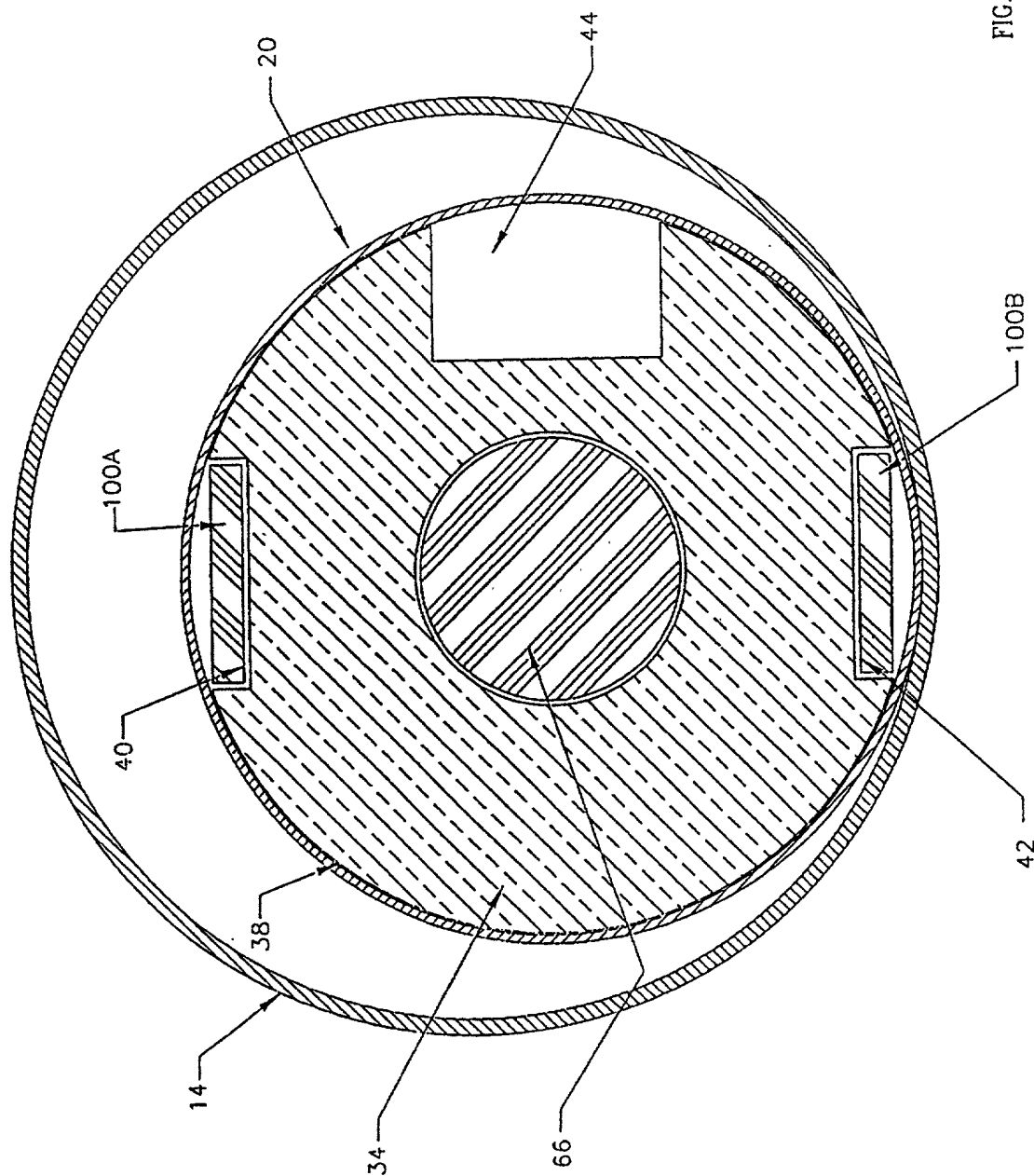


FIG. 4



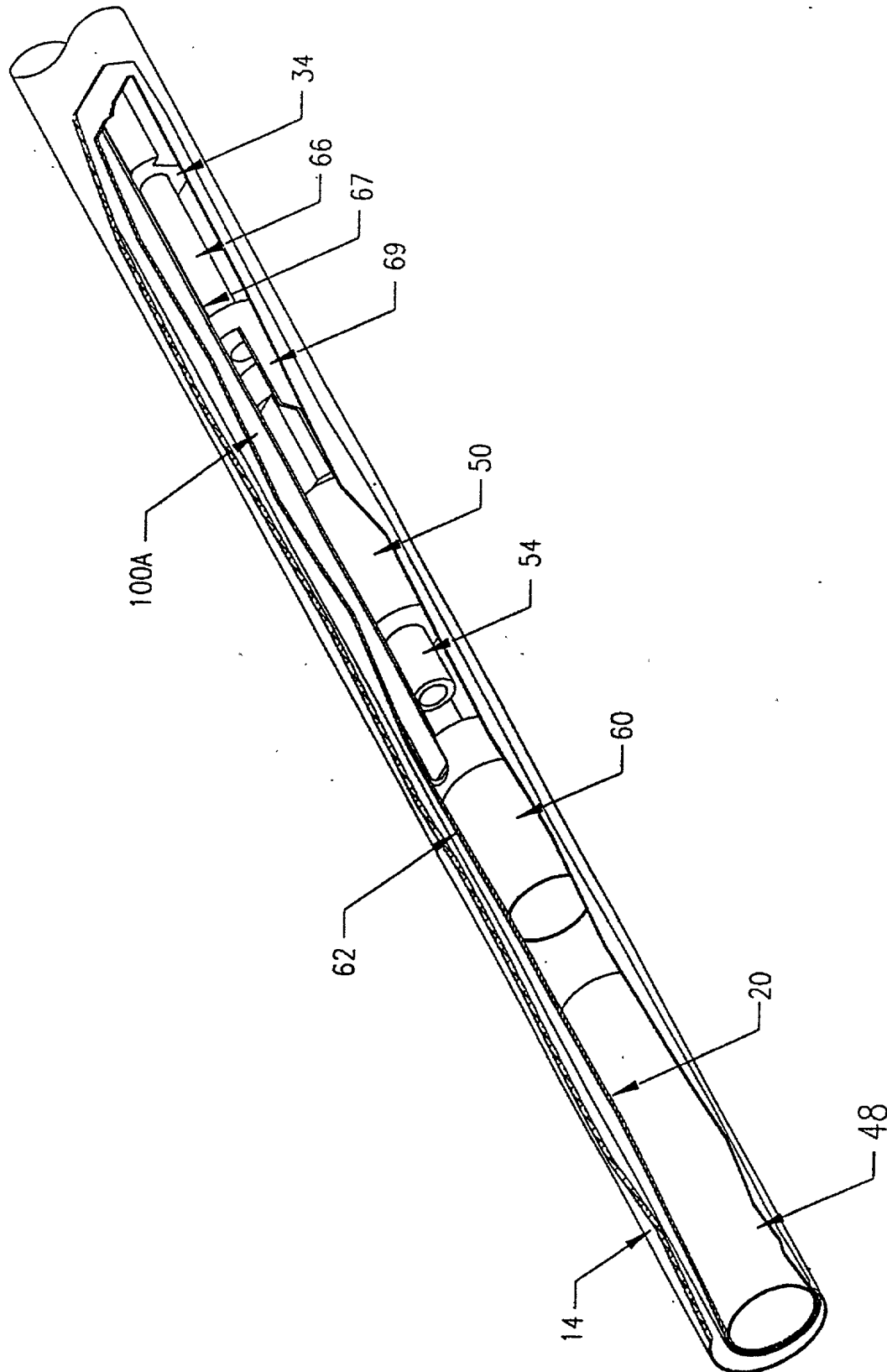
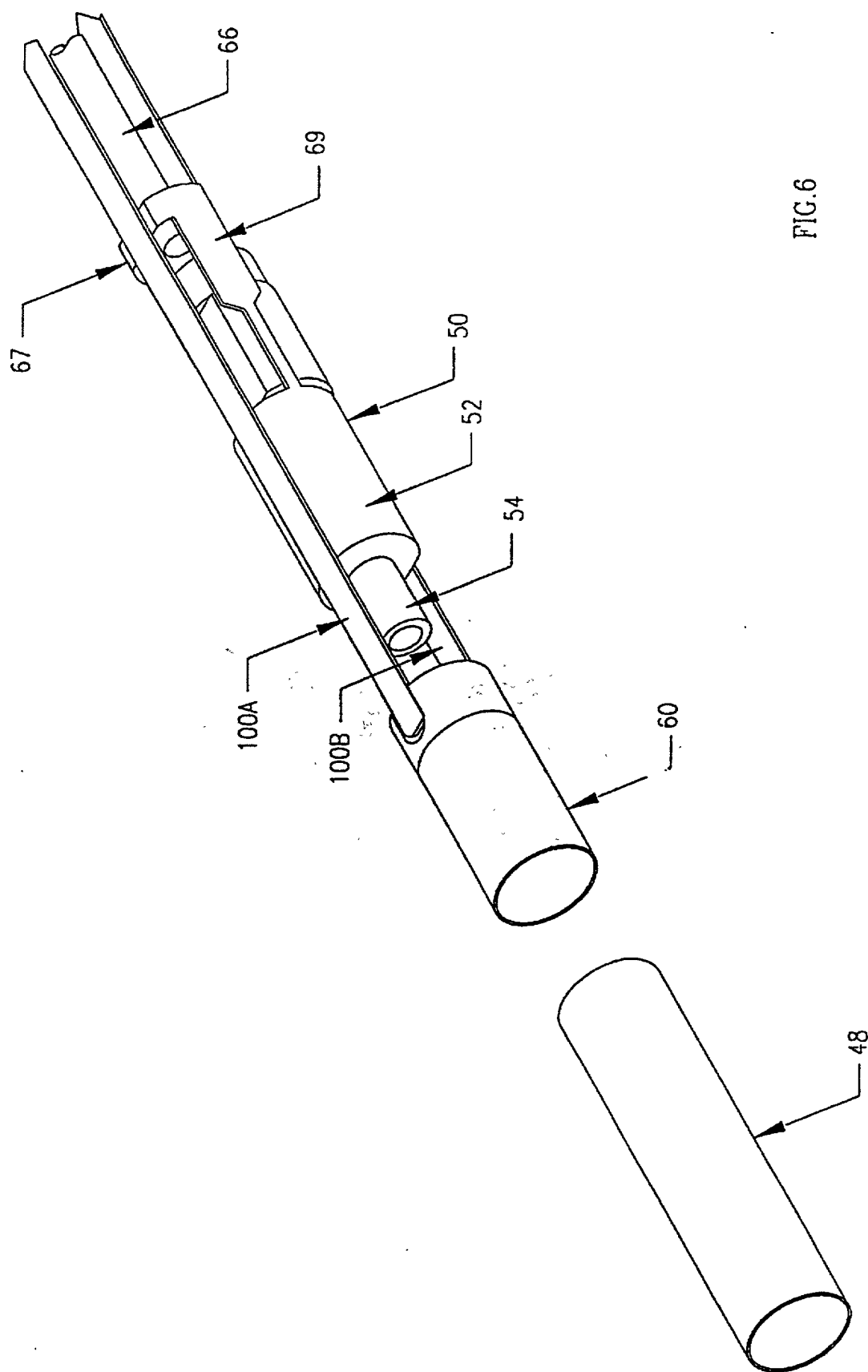


FIG. 5







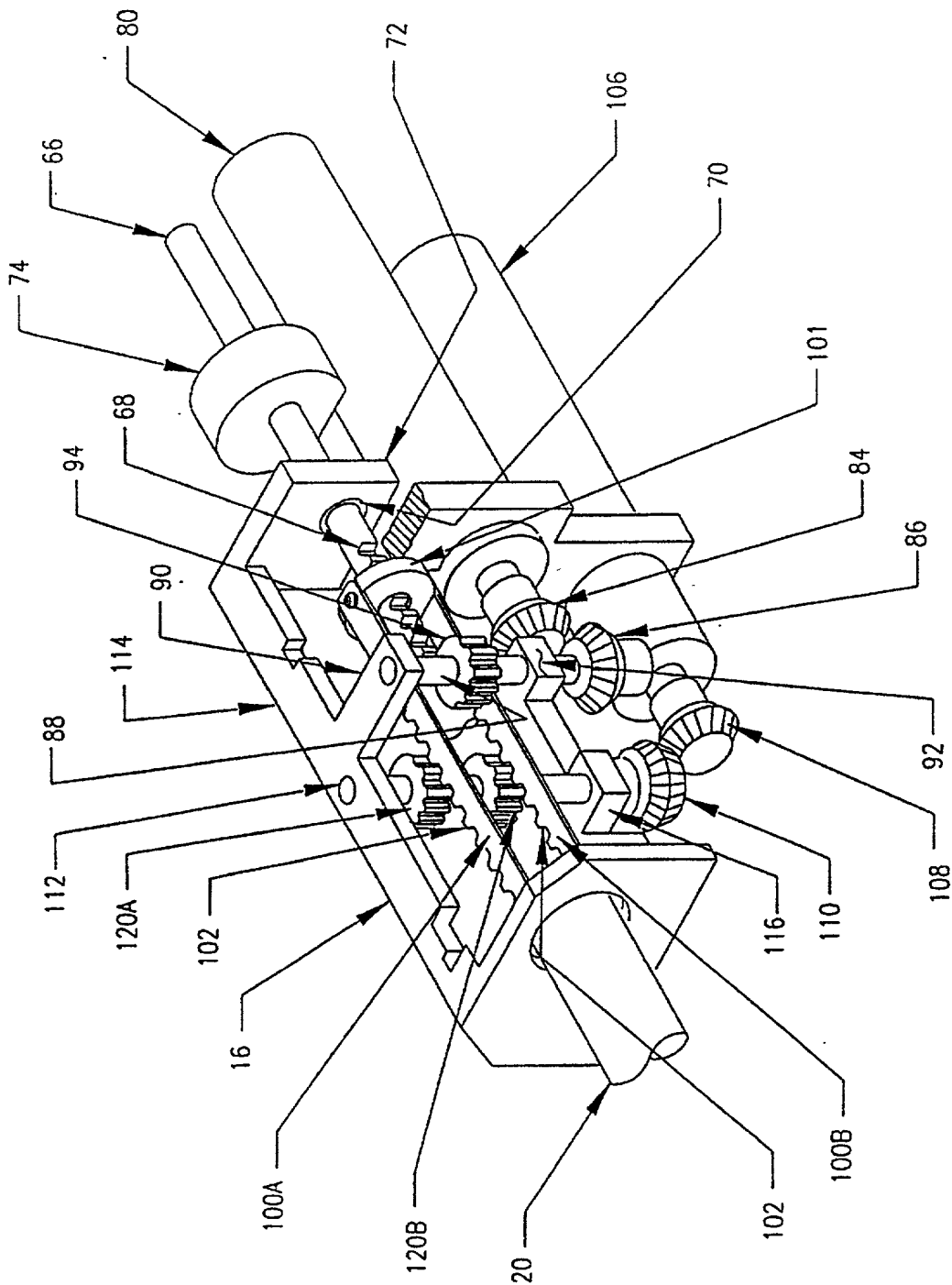


FIG. 7



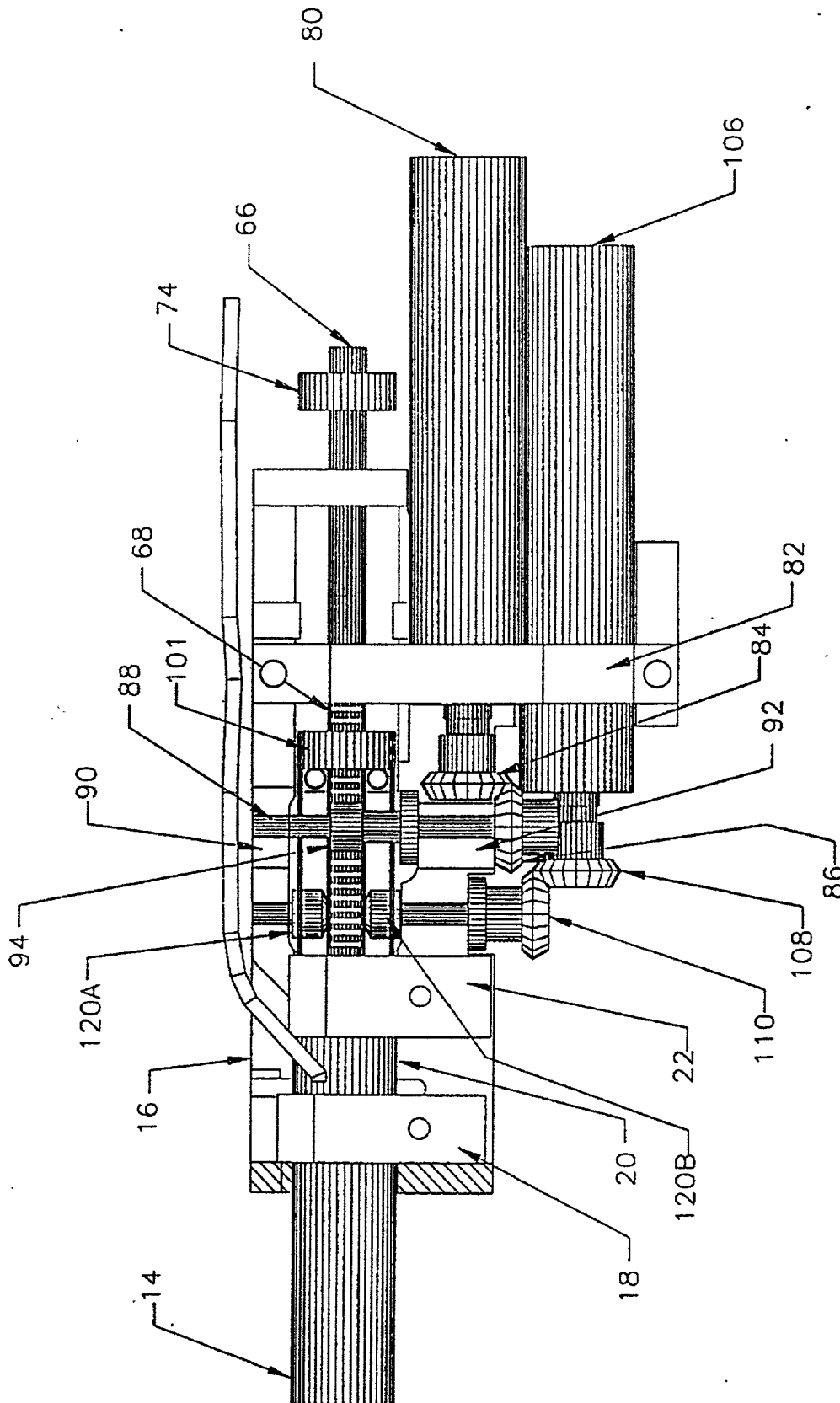


FIG. 8



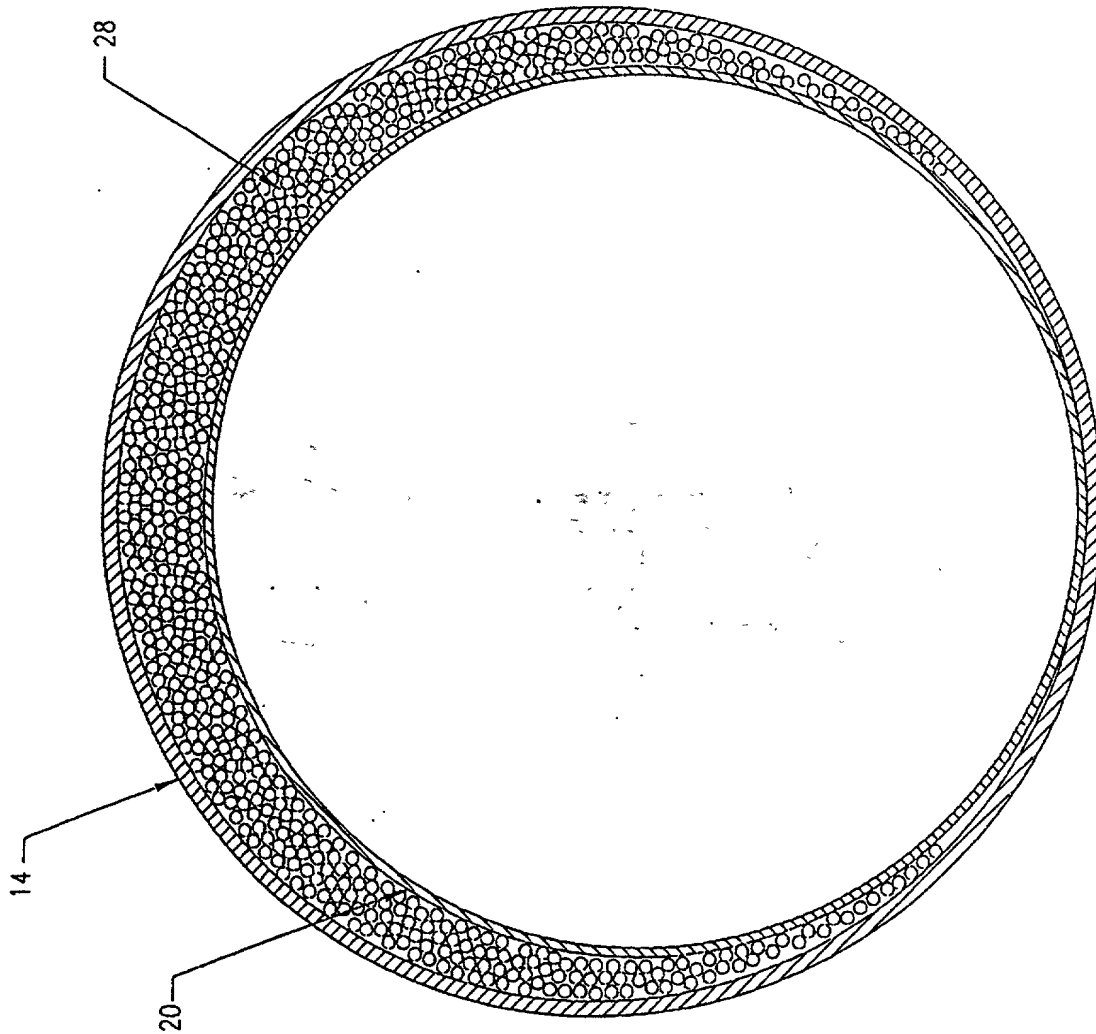


FIG. 9

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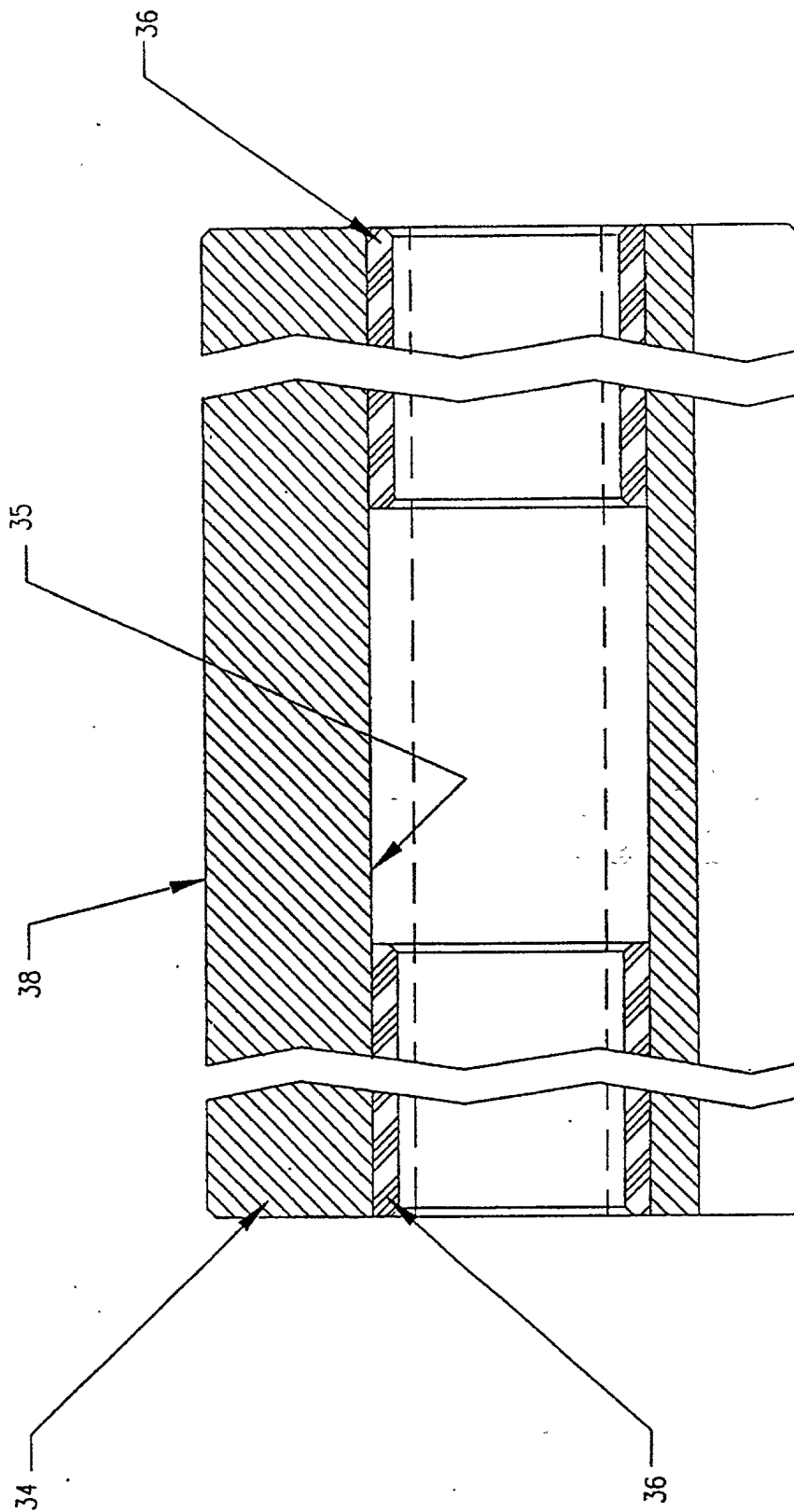


FIG. 10



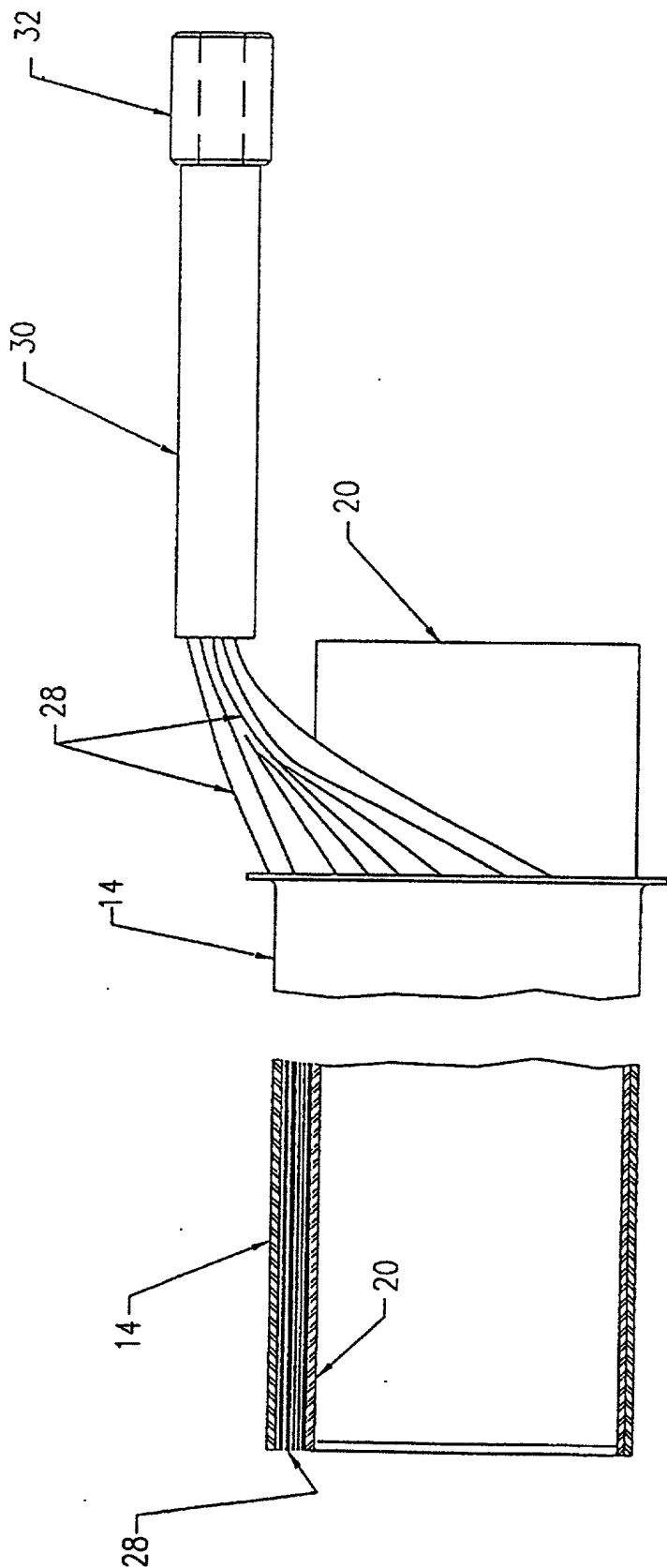


FIG. 11

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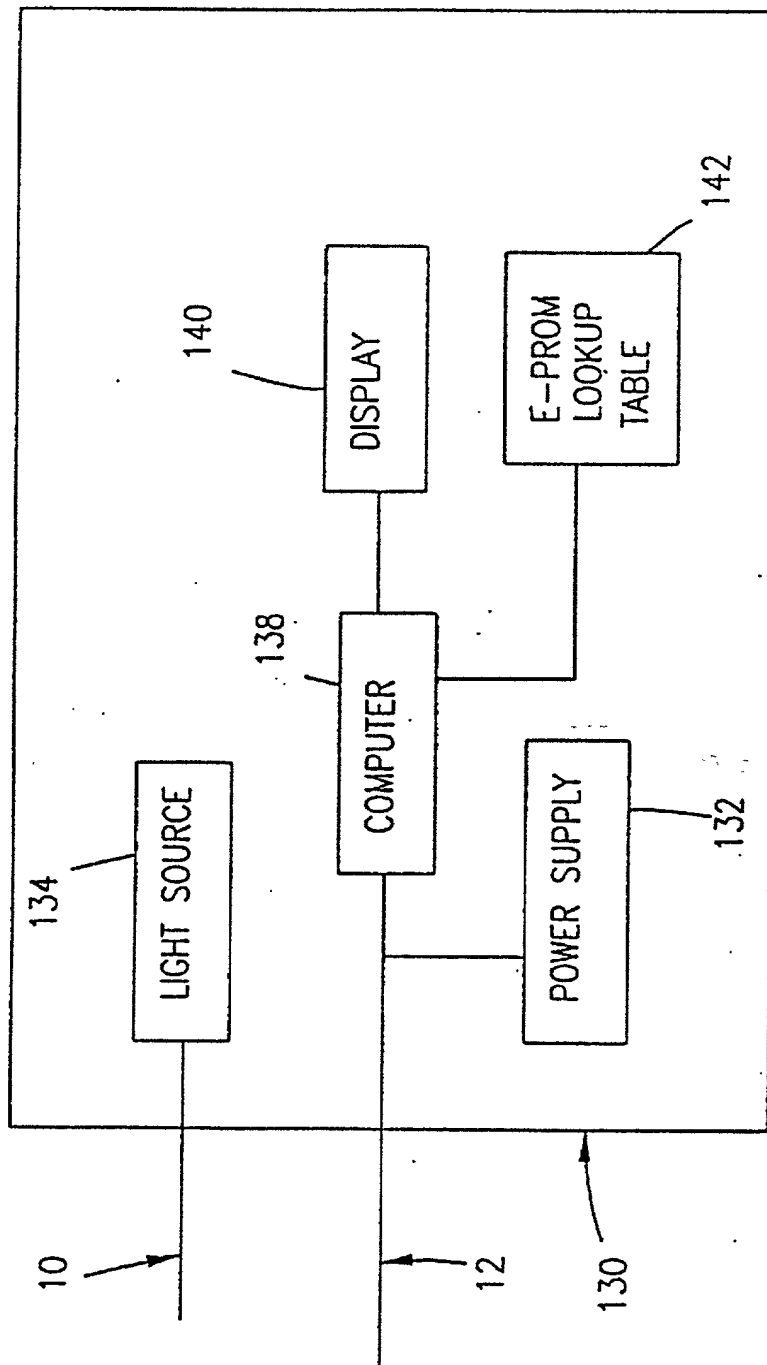


FIG. 12

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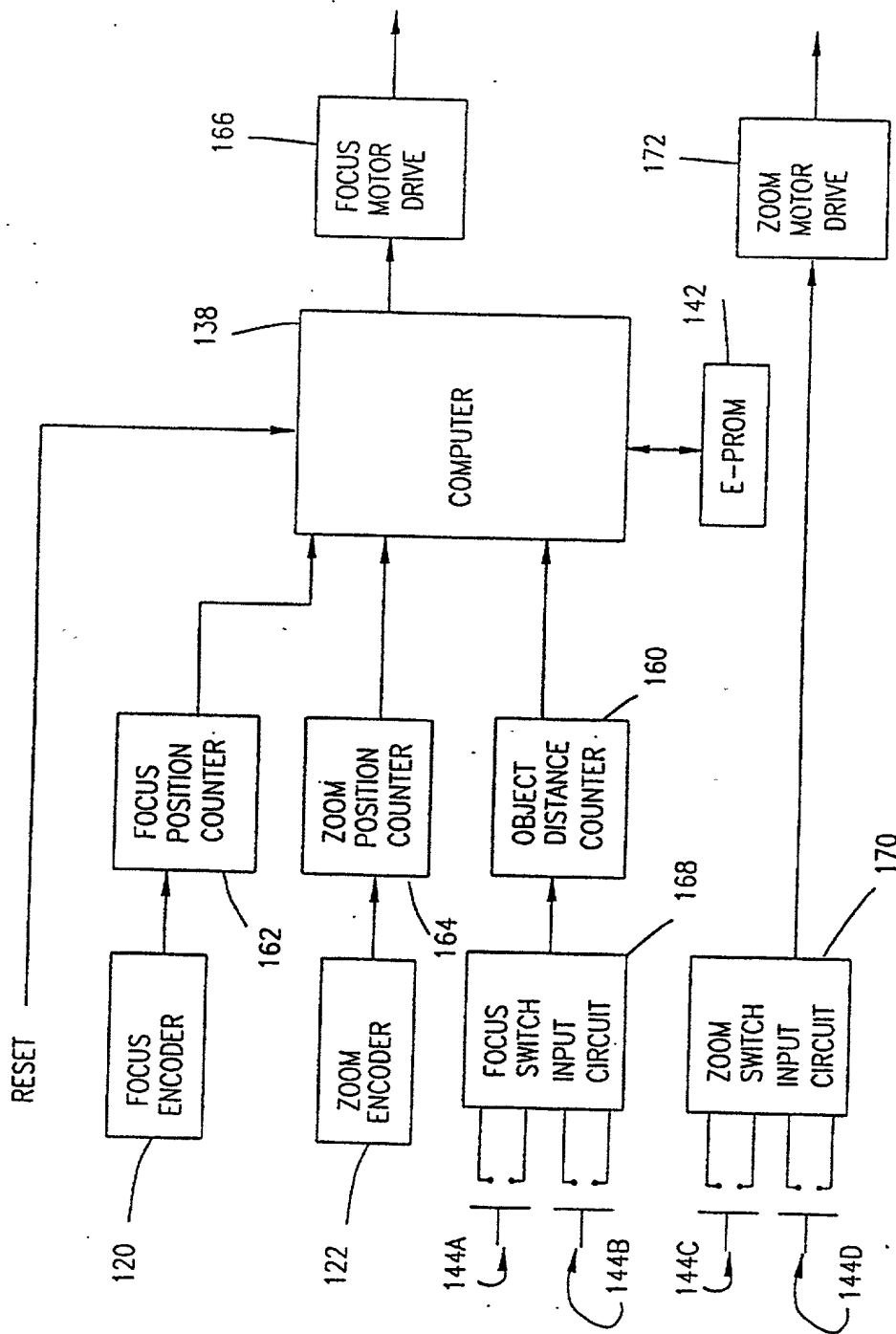


FIG. 13



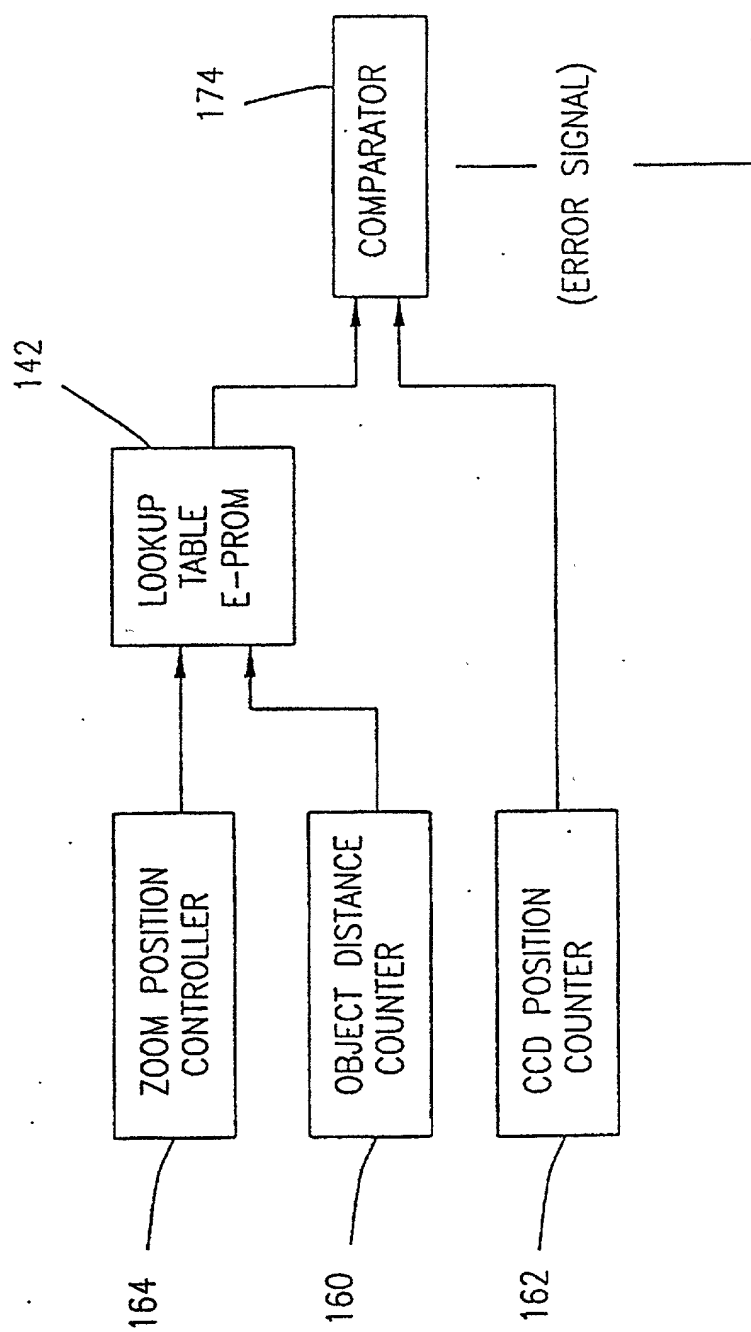


FIG. 14



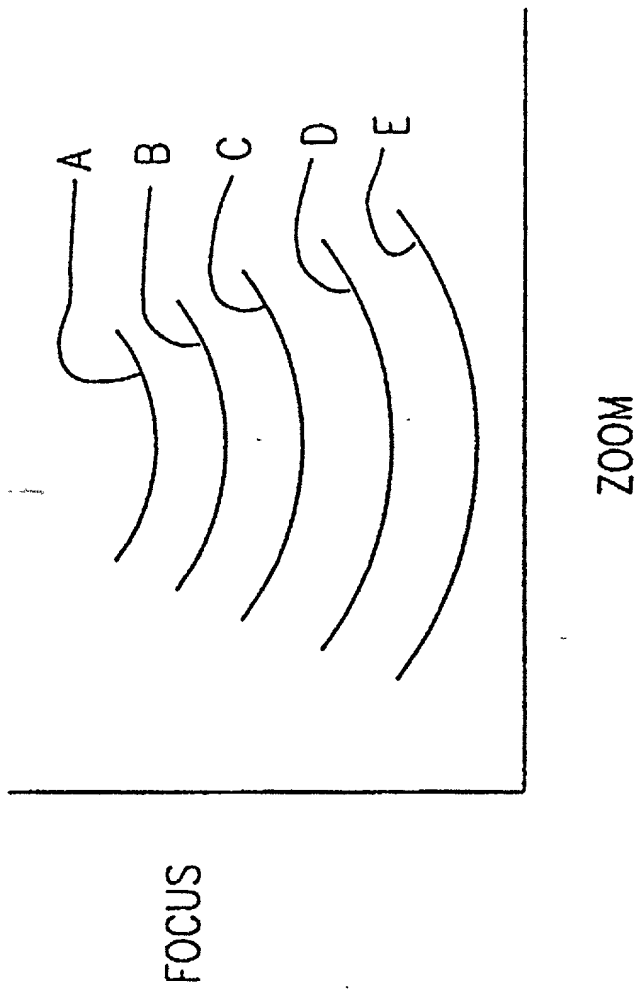


FIG. 15



000070 162460

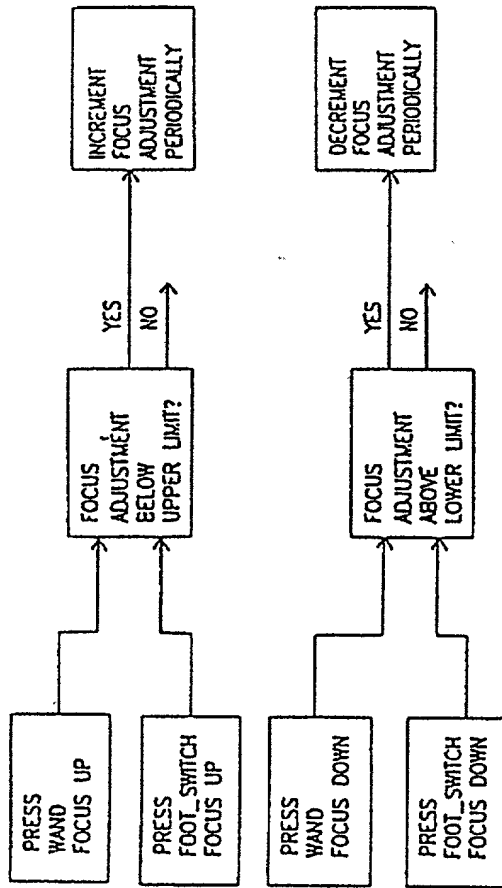


FIG. 16

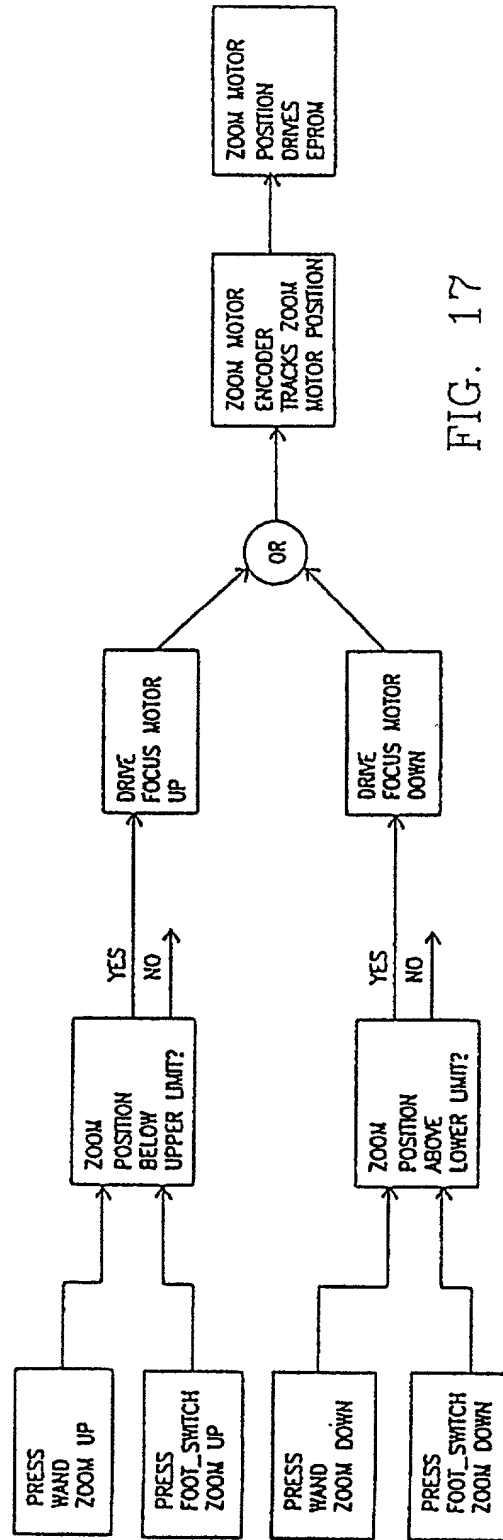


FIG. 17



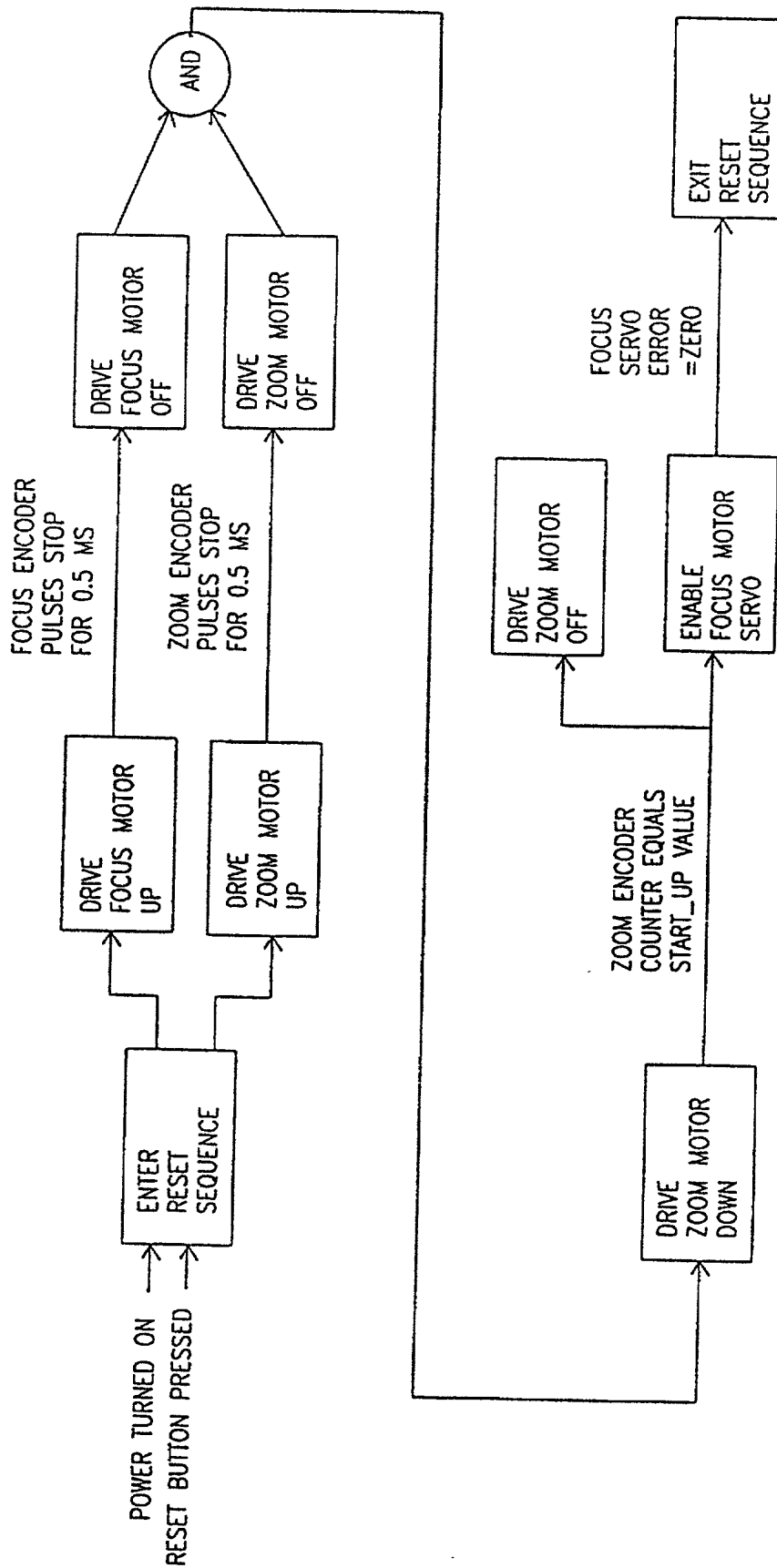
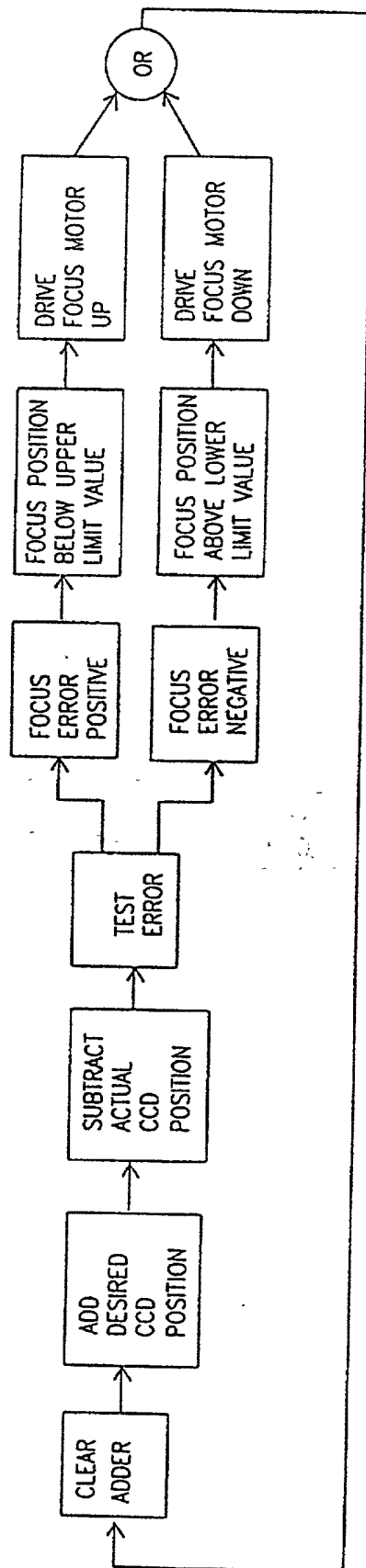


FIG. 18





REPEAT PERIODICALLY

FIG. 19



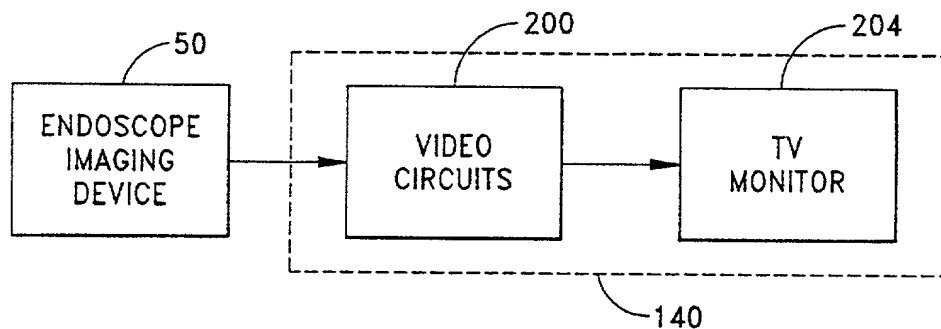


FIG. 20

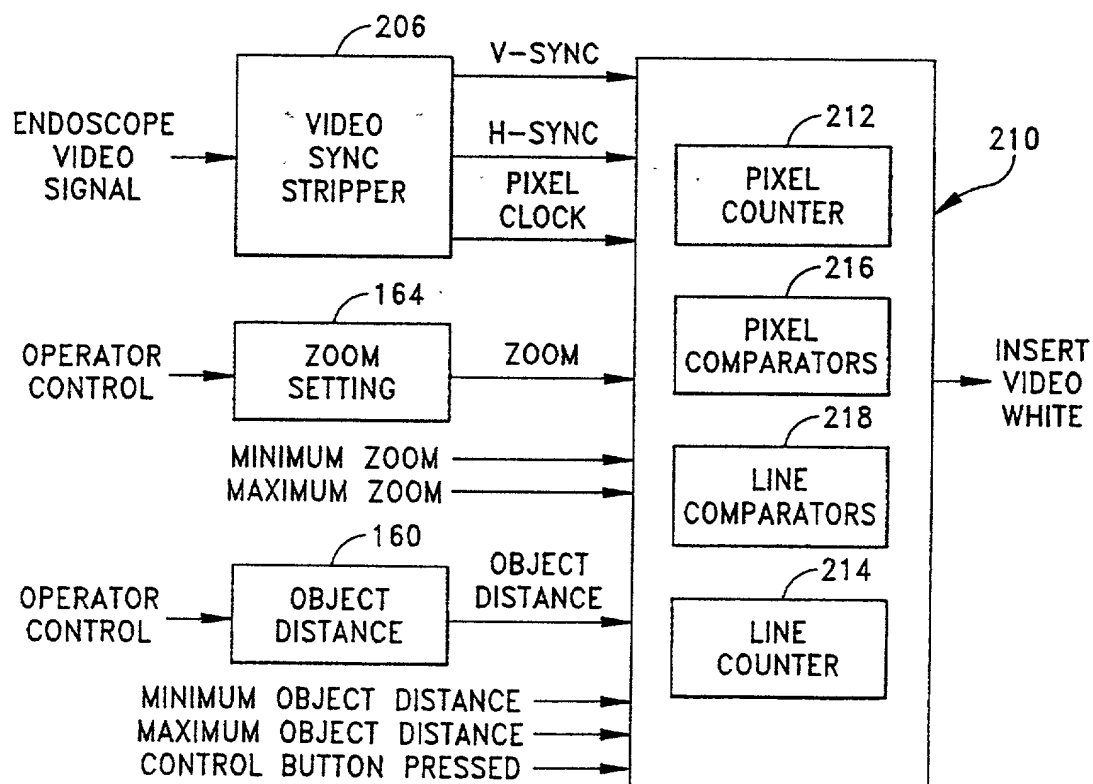


FIG. 21



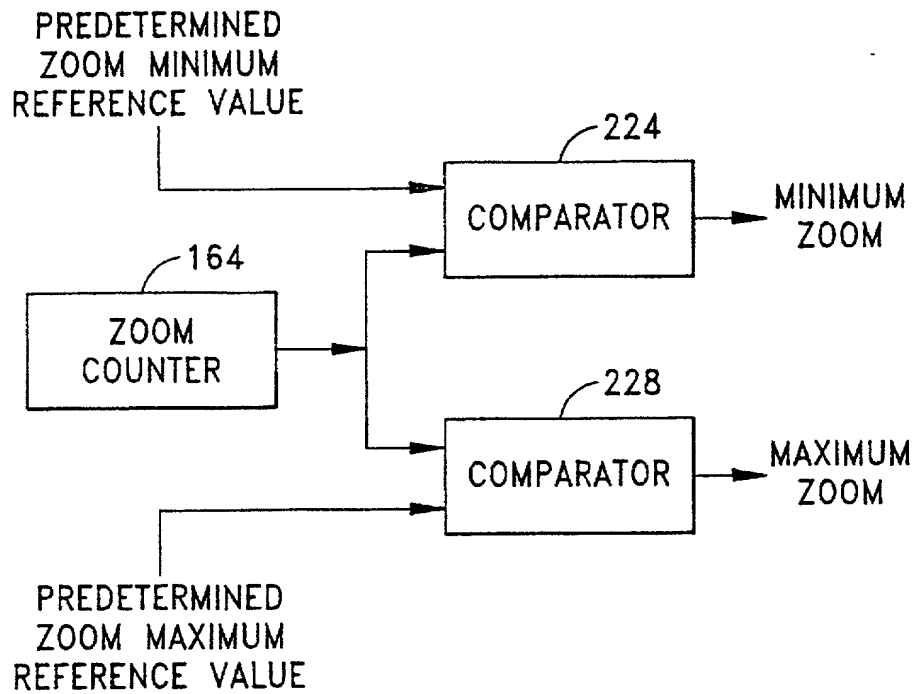


FIG. 22

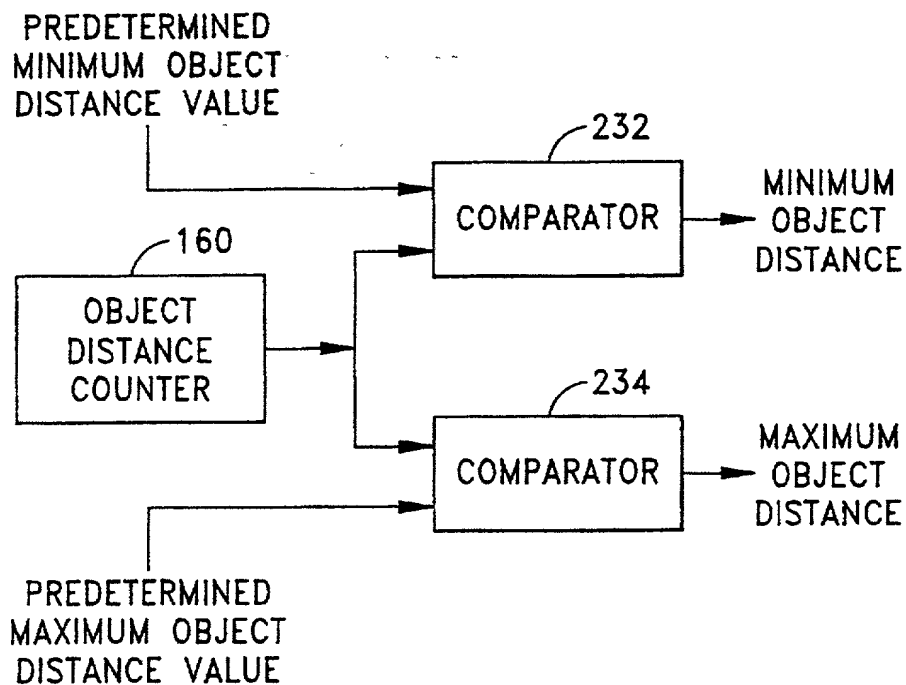


FIG. 23



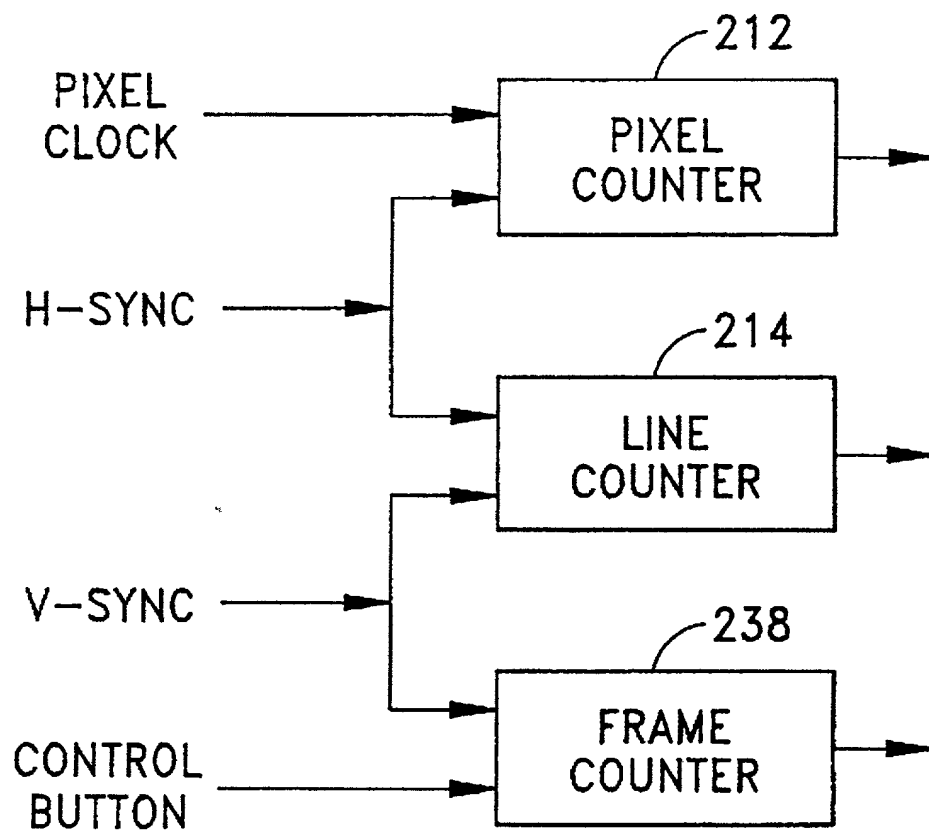


FIG. 24



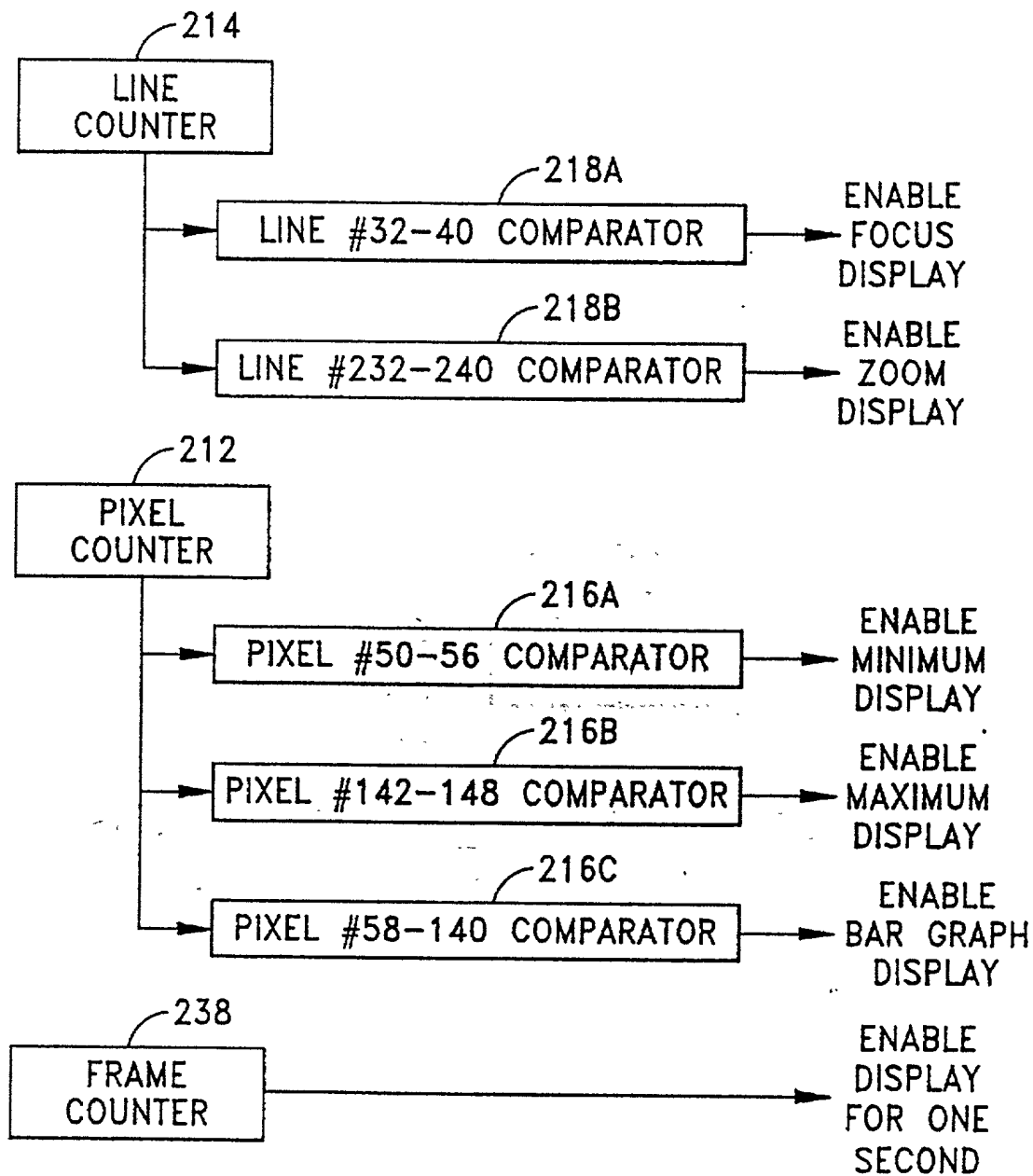


FIG. 25



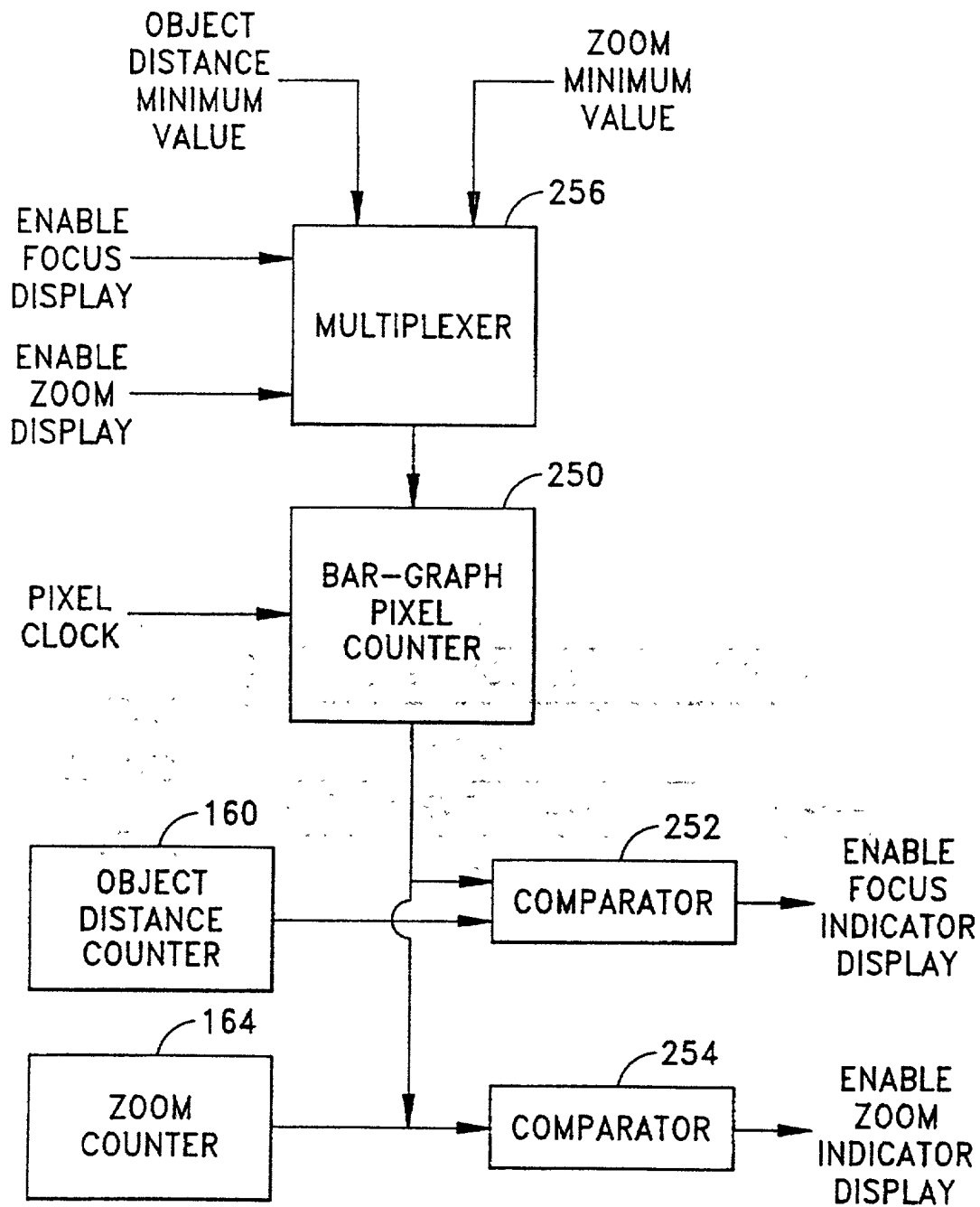


FIG. 26



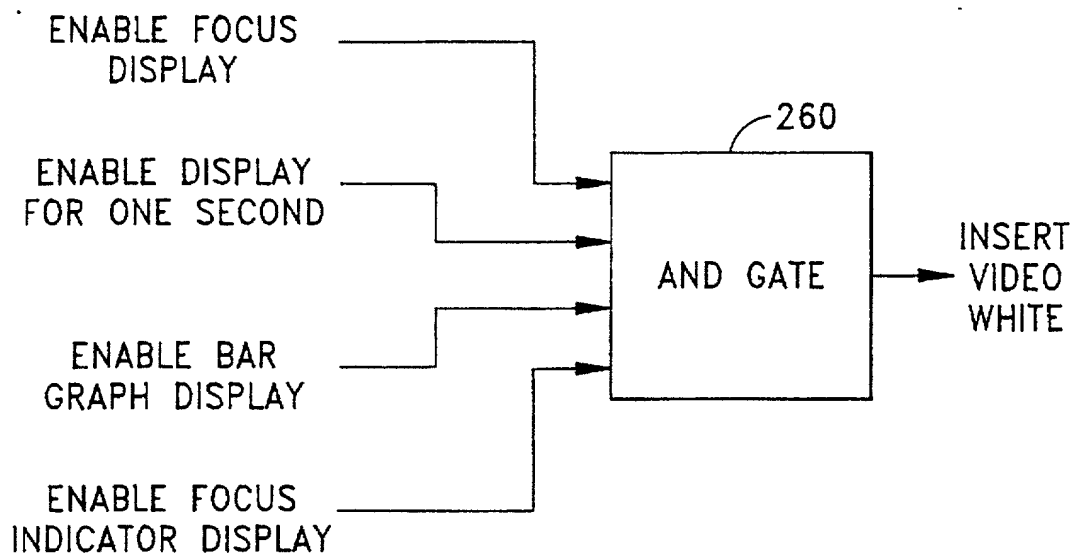


FIG. 27A

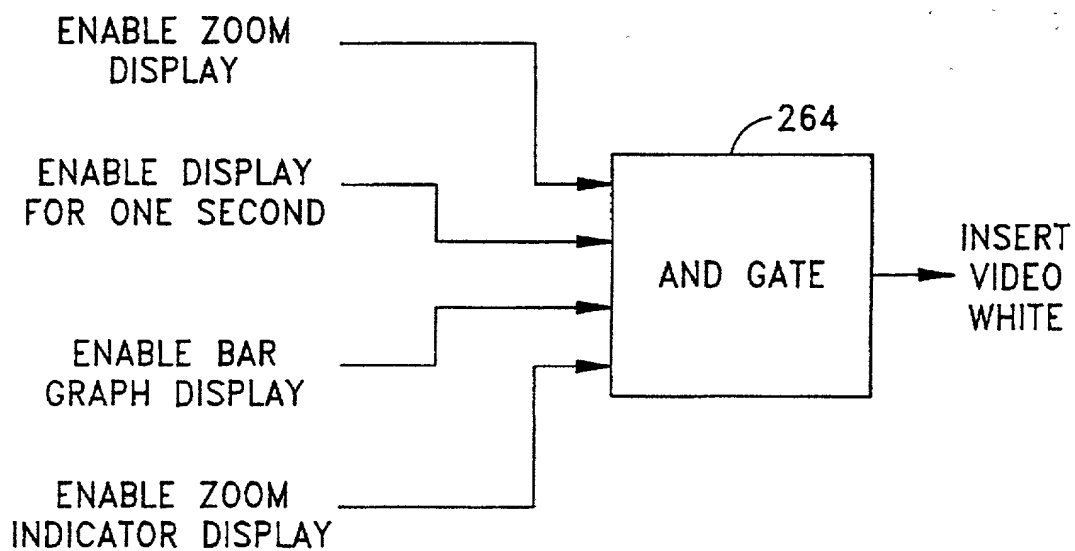


FIG. 27B



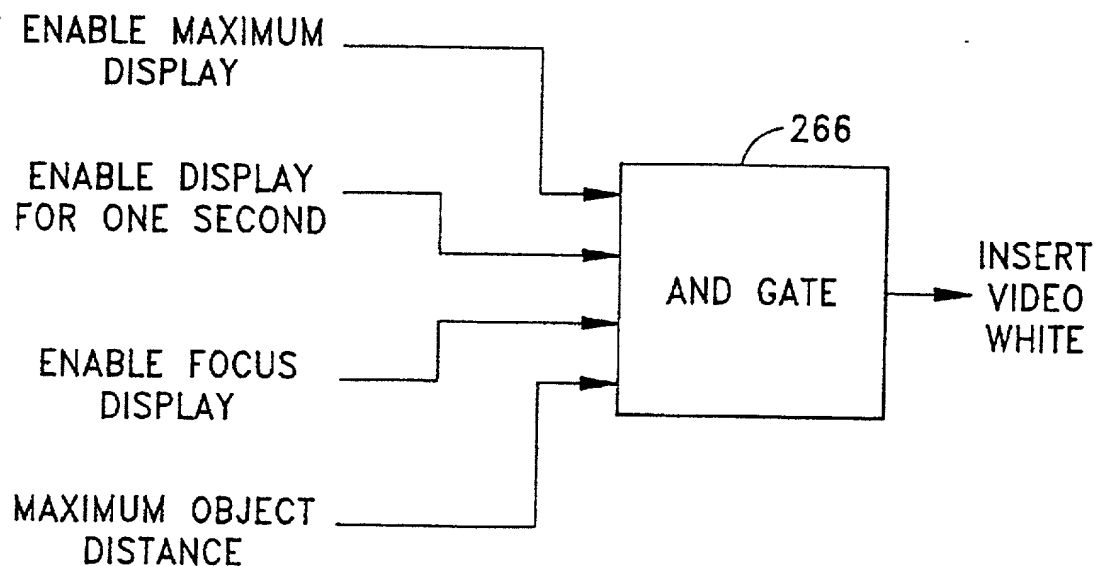


FIG. 27C

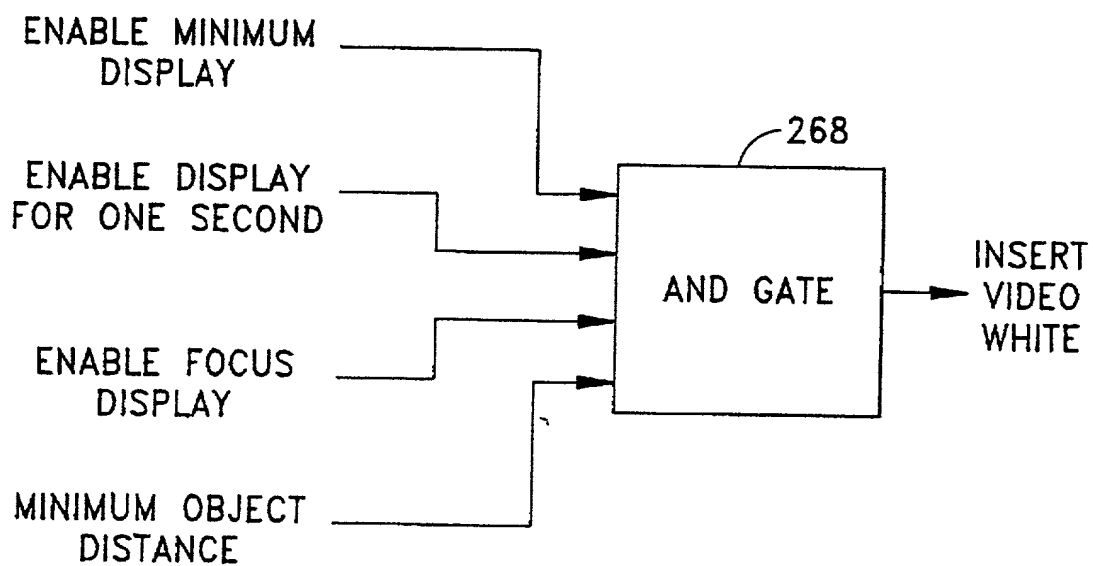


FIG. 27D



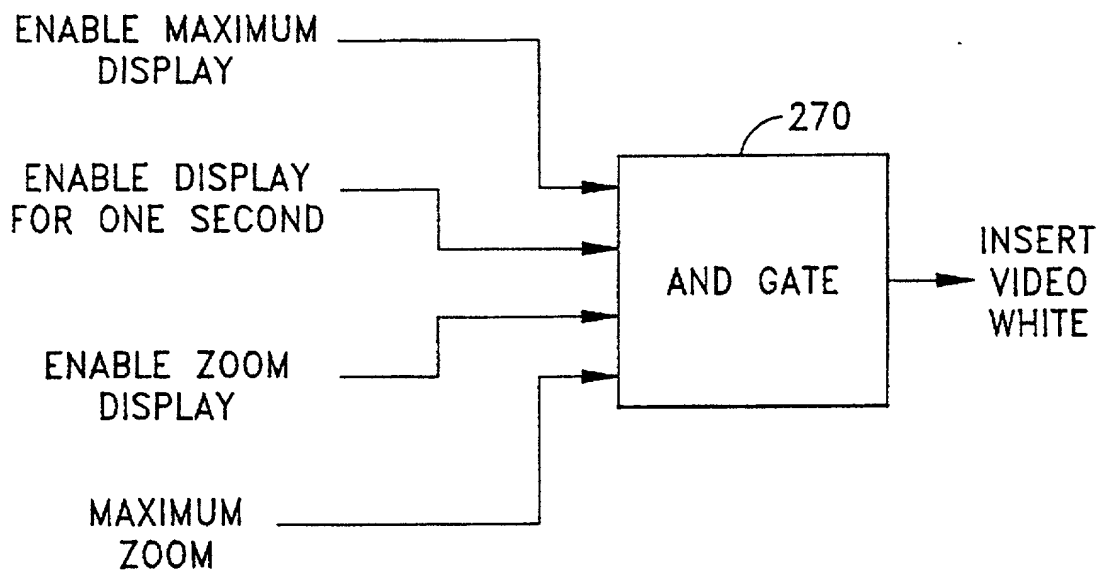


FIG. 27E

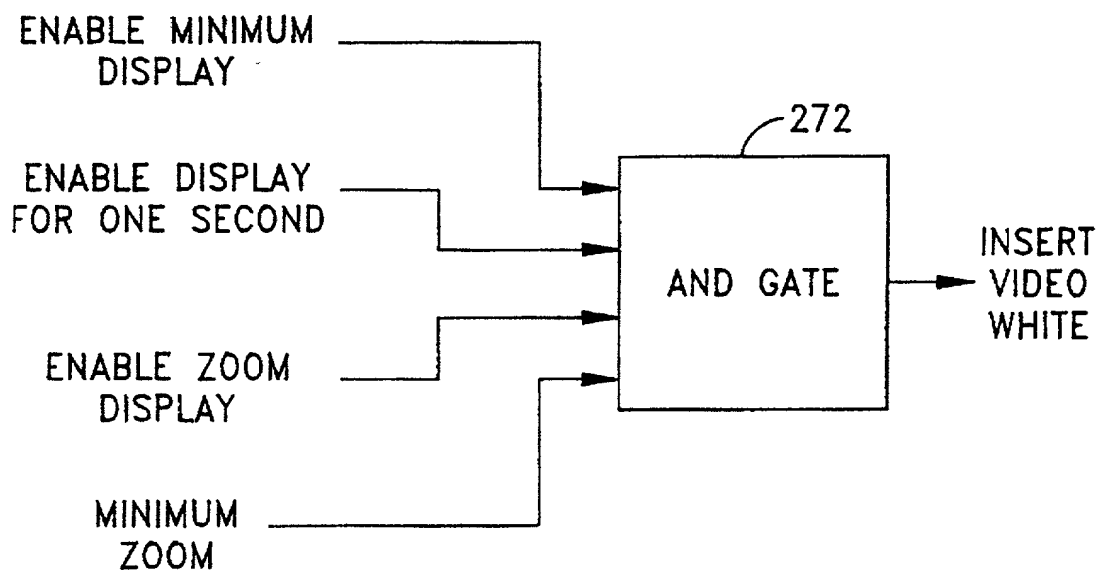


FIG. 27F



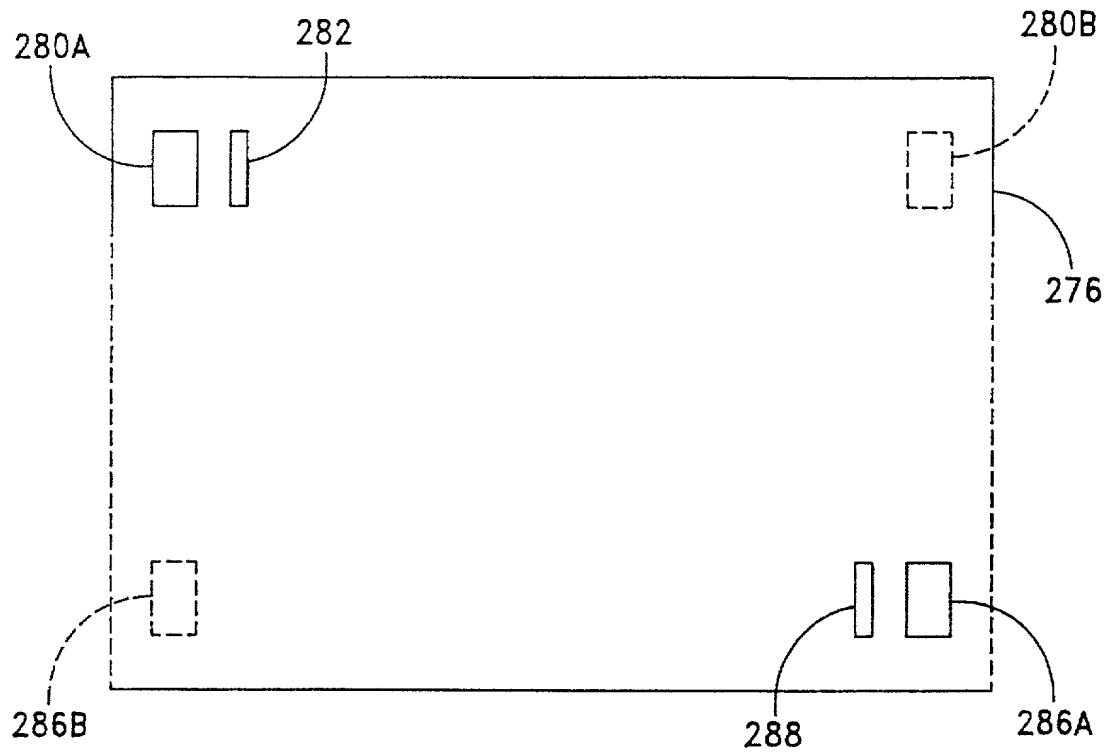


FIG. 28



PATENTIN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application for  
Reissue of: U.S. Patent No. 5,662,584  
Original Serial No.: 08/545,927  
Original Filing Date: October 20, 1995  
Applicants: Koichiro Hori et al.  
For: ENDOSCOPE WITH POSITION DISPLAY FOR  
ZOOM LENS UNIT AND IMAGING DEVICE  
Original Examiner: J. Leubecker (Group 3302)  
**Reissue Docket No.: OKTA-6 RE**

Box 7  
Assistant Commissioner for Patents  
Washington, D.C. 20231

REISSUE APPLICATION DECLARATION

And

POWER OF ATTORNEY BY INVENTORS

As the below-named inventors and applicants, we hereby declare that:

1. Our residence, post office address and citizenship are as stated below next to our names.
2. We believe that we are the original, first and joint inventors of the subject matter which is described and claimed in U.S. Patent No. 5,662,584, granted on September 2, 1997, for which invention we solicit a reissue patent pursuant to the provisions of 35 USC 251.

OKTA-6 RE



4. The above-identified U.S. Patent No. 5,662,584 is owned solely and exclusively by Vista Medical Technologies, Inc. by virtue of an assignment executed by us that was recorded in the United States Patent and Trademark Office, on October 1 1996, at Reel 8159, Frame 0005.

6. As required in 37 CFR 1.171, an order for a title report, accompanied by a request to charge the required fee to the Deposit Account of the attorney of record, as set forth in 37 CFR 1.19(b)(6), is filed herewith.

8. The assent of the assignee to this reissue application is set forth below.

10. We hereby state that we have reviewed and understand the contents of the above-identified reissue application attached hereto, including its specification and claims, and the accompanying affidavit of Nicholas A. Pandiscio.

OKTA-6 RE



12. We now understand and believe that said U.S. Patent No. 5,662,584 is partly invalid and inoperative by reason of claims 1, 7 and 9 of the disclosure containing errors which arose without deceptive intent.

13. On information and belief, the fact that the claims of the patent contain errors affecting the validity and operability of those claims and the patent was first discovered by our patent counsel, Nicholas A. Pandiscio, as explained in his affidavit which forms part of our application for reissue of said U.S. Patent No. 5,662,584. We have read his affidavit and incorporate it by reference as part of our reissue application.

14. The errors which are the basis of this reissue application, and which render our U.S. Patent No. 5,662,584 partly invalid and inoperative, are as set forth in the following sub-paragraphs A-C:

A. Claim 1, at column 16, line 21 (in the application, at page 27, lines 4-5), recites a tube "being mounted within said outer tube". That recitation is erroneous in that the claim contains no antecedent for "said outer tube". We believe that it was not necessary that claim 1 and its dependent claims 2-6 be restricted to an endoscope having two tubes, one inside of the other, since the novelty of our invention was not in the structure of the tube assembly but rather the electronic system for causing the display means to generate a video image representative of the position of at least the zoom lens or the CCD imaging device.

B. Claim 7, at column 18, lines 1-3 (in the application, at page 30, lines 7,8) recites "means attached to said handle assembly for connecting said proximal end of said light transmitting means to a light source". That recitation is erroneous in that there is no antecedent for "said light transmitting means". In this connection it should be noted that claim 7, in the patent, at column 17, lines 65-68 (in the application, page 30, lines 5-6) recites "a space between said outer and inner tubes for transmitting light to illuminate an object viewed by said objective lens unit," but does not positively recite any "light transmitting means" to which



the light source mentioned in the claim at column 18, lines 1-3 (in the application at page 30, lines 7-8) is connected.

C. Claim 9, at column 18, lines 16-18 (in the application at page 30, lines 18-20) recites "said light transmitting means". That recitation is in error as a redundancy since claim 9 depends from claim 7 and claim 7 already makes mention (column 18, line 2) of "said light transmitting means".

15. On information and belief, the changes we propose to make to the claims to correct the foregoing errors do not introduce any new matter, have an adequate basis in the specification of the application, and do not enlarge the scope of the claims.

Although we propose to delete certain language from claim 9 pertaining to the light transmitting means,, it will not affect the scope of that claim since we propose to insert substantially the same language in its parent claim 7. Furthermore addition of that language to claim 7 will have the effect of limiting rather than broadening that claim.

16. The foregoing errors in claims 1,7 and 9 all arose without any deceptive intent on our part and, on information and belief, without any deceptive intent on the part of our attorneys.

17. By this reissue application we also propose to (a) amend claim 7 by addition of the word "electronic" in column 18, line 9, and (b) amend claim 12 by addition of "output" in column 18, line 33. These amendments are not based on any errors that affect the validity or operability of those claims, but rather are presented merely for the purpose of eliminating any possibility of argument as to the antecedents or meaning. These particular amendments to claims 7 and 12 do not introduce any new matter, do not broaden the scope of the claims and do not raise any new issues.

18. We acknowledge that the Assignee retains the right to prosecute the reissue application of which this declaration is a part, and to receive any reissue patent granted on said application.

19 We appoint Nicholas A. Pandiscio, Registration No. 17,293; Mark J. Pandiscio, Registration No. 30,883; and Scott R. Foster, Registration No. 20,570; or any of them, all of the firm of Pandiscio & Pandiscio, 470 Totten Pond Road, Waltham,



20. We declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the reissue application or any patent issued thereon.

Kochin Host

**Residence:** 24 Parker Road, Framingham, MA 01701

Citizenship: Japan

Nachut A. Thaler

Residence: 680 Pleasant Street, Framingham, MA 01701

Citizenship: U.S.A.



**Assent of Assignee To Reissue Application**

I, Koichiro Hori, declare that I am a Vice-President of the Assignee, Vista Medical Technologies, Inc., and that I am authorized to act on the Assignee's behalf in connection with the attached application for reissue of said U.S. Patent No. 5,662,584. I further declare that Assignee assents to the attached application for reissue. I further declare that the foregoing statements relating to the Assignee are true and were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1 001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the reissue application or any patent that my issue thereon.

Signature: Koichiro Hori  
Name: Koichiro Hori  
Title: Vice President  
Assignee: Vista Medical Technologies, Inc.  
Date: Dec. 20, 1999

okta6re.dec

12/10/99

OKTA-6 RE